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Quality in teaching and learning: making it happen: the proceedings of the teaching & learning forum

Laurie Summers (Ed.)
Edith Cowan University

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EDITH COWAN
UNIVERSITY
PERTH WESTERN AUSTRALIA

QUALITY IN TEACHING AND LEARNING 'MAKING IT HAPPEN'



PROCEEDINGS OF TEACHING
LEARNING FORUM '94

Quality in Teaching & Learning

MAKING IT HAPPEN

Edited by Laurie Summers

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**The proceedings of the Teaching & Learning Forum
Edith Cowan University
Perth
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PREFACE

These papers represent the proceedings of the third Teaching and Learning Forum to be conducted in Perth, the first two by Curtin University and this one by Edith Cowan University. It seems only appropriate that we begin by acknowledging Curtin's initiative in getting things started and their even greater initiative in suggesting that each university take a turn or two at hosting the Forum!

The Forum brings together teaching staff from all four Unified National System universities to present and discuss their perspectives, philosophies, research and procedures. As such it is quite unique in Australia, so unique in fact that a number of people travelled from the Eastern States to participate.

The Forum was organised around three major themes - or at least it was in the beginning! Papers that were presented, and the discussion that was generated, led us to concede that there was really a great deal of interaction between the themes, which were:

- ways of defining quality
- working towards quality
- evaluating quality

Accordingly, we have not attempted to designate papers as being solely or even predominantly within any one of the themes. Rather, we present them in alphabetical order with outlines of workshops and short presentations taking their place alongside research papers - as was the case at the Forum.

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INTRODUCTION

The Keynote speakers for the Forum were Mike O'Neil from Nottingham Trent University in the United Kingdom and Associate Professor Peggy Nightingale of the University of New South Wales. They set the scene for what was to follow by sharing with us their thoughts on "Achieving Quality Learning" - which also happens to be the title of their new book, published by Kogan Page and now available.

In summary, Mike and Peggy presented what they considered to be the characteristics of high quality learning, namely all of the below:

- being able to discover knowledge for oneself
- long-term retention of that knowledge
- being able to perceive relations between old knowledge and new
- being able to create new knowledge
- applying one's knowledge to solving problems
- communicating one's knowledge to others
- wanting to know more

They then went on to point out that certain conditions in the learner are necessary for high quality learning to occur, such as having a learner who:

- is ready - cognitively and emotionally - to meet the demands of the task
- has a reason for learning
- explicitly relates previous knowledge to the new
- is active during the learning

and having an environment that offers adequate support for the learning.

When looking at the key element of 'good' teaching the keynote speakers, in concert with Gibbs (1992), noted that none were concerned with classroom 'performance' as such - motivational context, learner activity, interaction with others and a well-structured knowledge base were essential in promoting learning to learn and the acceptance of an ethos of lifelong learning.

In order to demonstrate that it is not only students who learn at Universities, participants were led through the "Action Research Spiral" of plan, act, observe, reflect, revise plan, act, observe, reflect, re-revise plan, etc as a way in which tertiary teachers might improve the quality of their teaching and their students' learning. The papers which follow are testament to the desire to improve on what is done in a professional and mutually informative way.

Laurie Summers
Head, Educational Development Unit

**BREAKING THROUGH THE ISOLATION OF INNOVATIVE TEACHING:
THE INNOVATIVE TEACHING FORUM AT UNIVERSITY OF WESTERN AUSTRALIA**

INTRODUCTION

Being innovative in teaching and learning in higher education is an important attribute for successful academics. 'Innovative' refers less to the actual practices themselves, and more to the state of mind of the academic concerned. It signals a willingness to change, to experiment, to reflect on experiences of teaching and learning and to consider actively better ways to teach. 'Awareness and interest in change' is the most important concept here.

Yet change does not come easily. There are barriers. The desire to experiment and innovate may be strong, but departmental structures which are against change may stifle the innovative individual. Problems may arise which, because an academic is up to their neck in 'the swamp' of work, they may not easily be able to get around with lateral thinking. Planning of innovative practices before the event, or reflection on them after the event is hard if there is no one else around with whom to talk. Change can also be threatening for close colleagues: they may not share an innovator's enthusiasm, or may see in the innovator a rival for promotion. Since innovation involves a break from past practice, it may be hard - even for an innovator - to give away traditional practices without assistance from some-one who is an outsider to that tradition. Innovation can be a lonely business when there are no formal structures to remove the isolation of the lone innovator. This isolation is itself a major barrier to both changing the way we teach and changing successfully.

For all these reasons, successful, sustained innovative teaching practice requires the innovative individual academics to talk to another regularly about what they are doing, why they are doing it. This interchange of ideas not only helps resolve problems, but stimulates further innovation - breaking through barriers of isolation imposed by negative colleagues within departments and by traditional ways of doing things. It also ensures that innovation, which can often be a silent and personal struggle, becomes more public, better recognised and more valued. Where an intellectual and practical contact network is focused on teaching and learning, it also provides a new way of considering academic life, removing disciplinary boundaries and throwing open all sorts of assumptions about links between disciplinary practice (which is usually an outgrowth of the discipline's *research* culture) and teaching (which may only co-incidentally relate to research).

THE INNOVATIVE TEACHING FORUM: ONE SOLUTION

Mostly, academics talk about their teaching in two ways: *either* unstructured, casual or irregular dialogues with close friends or partners or structured, occasional conferences with many strangers and with an agenda set by some-one else. These two ways are good in themselves, but do not provide all the support and stimulation needed for successful teaching innovation.

What is missing is the regular, but casual, slightly structured conversation with colleagues who share similar interests but have different experiences of teaching and learning and are supportive but not so close to the innovator that a critical distance cannot emerge. At the University of Western Australia, in 1992, the Innovative Teaching Forum (ITF) was established to provide a structure for this sort of conversation.

Talking about teaching and learning can be fun! We need to do more of it. It is enlightening, supportive and stimulating. Talking about teaching and learning, sharing experiences, reflecting on what we have done, suggesting new ideas is probably the best form of 'training' for academics who have already developed an interest in this area. The ITF was explicitly designed to move the practice of developing better ways of learning away from the staff development unit and give control firmly to the academics who were at the chalk-face of teaching.

THE ITF AT UWA

The ITF was initially designed around the concept of drawing together academics who, by virtue of having attended staff development functions and workshops, had identified themselves as interested in teaching and learning. They would form a group, which kept in touch with UWA's Professional and Career Development unit, but which was separate, setting its own agenda and practices. A facilitator was appointed to help coordinate the group's activities and provide the structure and continuity needed. This core group later expanded to include academics who had not yet been directly involved in staff development activities but who were nevertheless interested in different approaches to teaching and learning.

In 1992-1993, the ITF met in two main ways - in 1992, we had longer meetings less regularly (with an original and a repeat session to make the meetings available to people with commitments at the first time) and in 1993, via shorter meetings every week at lunch-time. In the latter case, the aim was to establish a larger pool of members who came when they felt like it, knowing that there would always be enough people to maintain a discussion. Group meetings were either structured around a theme, or left 'free' for a discussion of the main issues in members' teaching lives at the moment. Sometimes a 'key speaker' would come, but would speak only briefly - for about 10 minutes - to ensure that the ITF remained a conversational forum.

The discussions were free-flowing, covering a range of issues which might not have been mentioned in more formal settings. A prime example was the extended conversation which members had one week about what clothes to wear when lecturing. A mark of the conversational nature of the meetings was the active participation of many people at each meeting - the ITF attendees were there to talk as well as listen!

The ITF also published and distributed a newsletter to ensure that members who did not or were unable to attend still kept in contact with developments. The newsletter provided a vehicle for brief commentaries on the overall context of teaching innovation (for example, the government's policy initiatives in the area of quality), for editorials by the facilitator reminding academics that they were not solely responsible for good teaching - that there were institutional barriers and opportunities and that academics who were unable to innovate as they wished should not think themselves 'to blame'. The newsletter gave most of its space to short descriptions by academics of their innovations, or summaries of ITF meetings. It was like we were all involved in writing the material for a practical handbook on teaching and learning - we joked about calling it: '53 interesting things happening in teaching at UWA'.

PROBLEMS AND ADVANTAGES

There are some problems with the ITF which need to be considered in establishing a similar group elsewhere.

There was a lack of commitment from academics involved, which had a variety of causes - a lack of interest, a lack of time, the pressures of being overworked, or the lack of tangible reward. Time

clashes meant that we could never arrange a time to allow all interested people to attend. Towards the end of each year, the ITF meetings exhibited the Casablanca principle - "Round up the usual suspects" as it became increasingly difficult to maintain enthusiasm and to attract new people to discuss their problems and contributions. The ITF's loose structure did not suit everyone - some wanted more structure (which others said would turn them off the idea): we couldn't please everyone. And finally, though cross-disciplinary conversations worked well most of the time, some problems were too specifically departmental or discipline-oriented and could not be resolved in a general forum.

But there were lots of advantages as well.

Good personal contacts were built up which survived and prospered outside the ITF. People found it very useful simply to blow off steam about some difficulty they were facing, especially from unsupportive colleagues; they also found it exciting to share ideas and have people tell you later they tried them successfully. The meetings generated lots of good material for the newsletter, which meant that the effective reach of the ITF was far wider than just those who attended meetings. The ITF also provided a venue for senior administrative leaders [such as the vice-chancellor and deputy vice-chancellor (academic)] to discuss university policy developments - it was structured, organised opportunity for grass-roots contact between the administrators and the teachers. The ITF also provided a way of generating formal reports to the administration about teaching and learning and, amongst other developments at this time at UWA, raised the profile of teaching in the university.

ADVICE FOR FUTURE ITFS

Very briefly let me offer the following advice for establishing ITF's at other universities. An ITF can help innovative teachers provide the following:

- informal but regular contact between like-minded innovative teachers;
- relaxed sharing of ideas, assistance with problems, reports of good practice;
- cross disciplinary discussion - focuses intellect on teaching and learning;
- 'gripe' session about difficult colleagues, lack of recognition, no funding; and
- increased status of teaching and learning in institution.

And, an ITF organiser should pay attention to the following issues:

- you must contact and enthuse plenty of academics who are already interested by offering them more than they already get from staff development groups;
- you must overcome lack of time (real or apparent) - make it tangibly worthwhile, but don't over-structure/formalise the ITF;
- you must publicise and distribute ideas via newsletter - or e-mail;
- you must involve students - they are really great sources of information; and
- you must gain official status so as to impact on university policy.

RETURNING TO THE NURSING WORKFORCE USING COMPUTER BASED
EDUCATION PRESENTED AT THE TEACHING AND LEARNING FORUM 1994

ABSTRACT

The initial aim of the Renewal of registration Programs at the School of Nursing was to enable nurses, who had previously been registered, to return to the nursing workforce in Western Australia.

The General Program commenced in 1989 in an effort to renew the registration of local nurses living in rural Western Australia. The Midwifery Program was initiated for similar reasons in 1990. Primarily, the programs were designed for nurses living in rural Western Australia, however, due to demand they have been determined to be equally suitable for urban nurses.

This paper initially describes the development of these programs. A description of evaluation data will be summarised, including employment status of the graduates. Student involvement in the evaluation process of the program will be outlined. The development of clinical evaluation of student competency will be presented. Finally, methods utilised to deal with the varied backgrounds of students will be described.

INTRODUCTION

The presenters are Maryanne Artus, Coordinator of Renewal of General Registration Program and Rosemary Keenan, Coordinator of Renewal of Midwifery Registration Program. Both are registered nurses and lecturers at Curtin University of Technology, School of Nursing.

This paper will describe the history of General and Midwifery Renewal of Registration Programs in Western Australia, two of the four programs offered by Computer Based Education Programs at Curtin University of Technology, School of Nursing. A selection of evaluation methods and results will be described.

HISTORY AND RELEVANCE FOR WESTERN AUSTRALIA

The professional regulating body for nurses in this state is the Nurses Board of Western Australia (NBWA). This body administers the Nurses Act (1992) and renews annual registration for currently practising nurses in six parts of the Register. Prior to the Renewal of General Registration Program at the School of Nursing at Curtin University of Technology, nurses in Western Australia (WA) were limited to renewing their registration in the metropolitan area with an occasional rural course.

Until 1990 there was a shortage of registered nurses in rural WA, making it essential that a system of reregistering resident or local nurses be considered as a higher priority than filling vacant positions with nurses from elsewhere.

Such a problem in Western Australia is compounded by the vastness of the state. Geographical distances prevent many rural nurses from attending existing refresher courses. Nurses residing in small, sparsely populated areas, are additionally deprived of inter professional and collegial

interaction. A coordinated effort was vital to achieve both access and standardisation in terms of cost effectiveness of learning materials.

The Curtin University of Technology School of Nursing set up, on behalf of the Health Department of Western Australia, a program for the renewal of registration of nurses in Western Australia. The Renewal of General Registration Program has been adapted from the Grant MacEwan Program of Edmonton, Alberta, Canada. In Canada, the course is referred to as the Nurse Credentialling or Nursing Refresher Program, which became computer managed in 1983. In August 1987, a team of people at Curtin University and in other health agencies, reviewed, modified and adapted the program to suit the health care needs in Western Australia. The program is computer managed learning and was geared especially to meet the needs of students and health care agencies in rural WA.

In August 1988, the first students commenced the adapted program. In 1989 a pilot program was conducted to evaluate the program for nurses from non English speaking countries to gain registration in Western Australia. As a result of the success of the program, overseas nurses from non English speaking countries have been mainstreamed with the Renewal of Registration students. By 1991 the Midwifery Renewal of Registration Program had been developed and commenced. To date, there are four programs that have been developed along this format.

The programs are coordinated through the Curtin University School of Nursing Learning Centre. See figure 1. Students access the mainframe VAX 11/750 using Learning Management System software. Learning Centres are also situated in major rural locations at Albany, Bunbury, Geraldton, Kalgoorlie, Port Hedland, Derby, Narrogin and Katanning. A second metropolitan centre was opened in 1993 at the Australian Institute of University Studies at Joondalup.

Each of these centres utilises the Outspoke telecommunication mechanism which directly links to the mainframe VAX computer at the University. Some geographically isolated students undertake their testing under supervision close to or at home, communicating with the Learning Centre by mail, fax and telephone.

RENEWAL OF REGISTRATION PROGRAMS

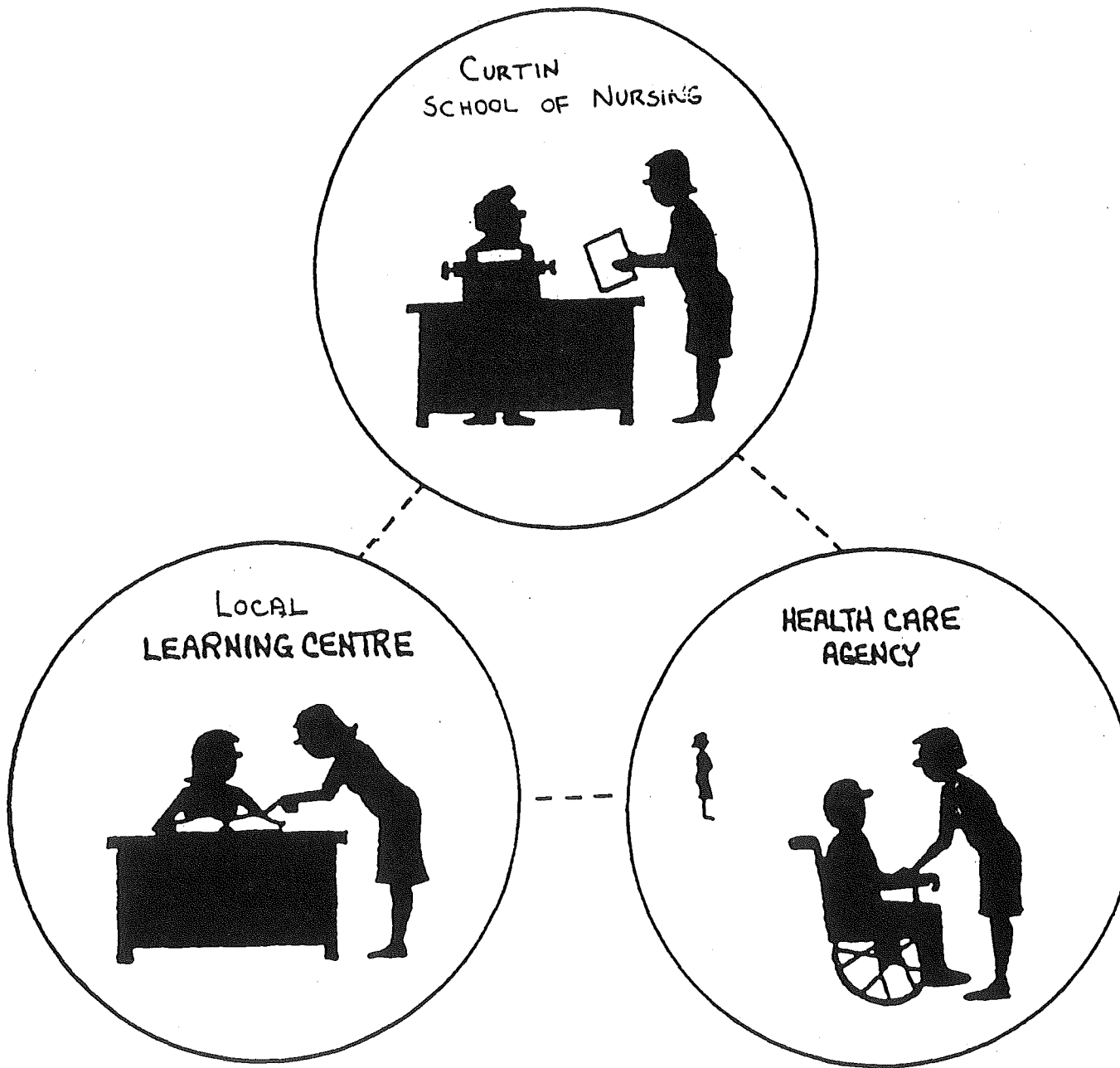


FIGURE 1

SOURCE: GRANT MACEWAN COMMUNITY COLLEGE (1987).

PURPOSE

The Programs are designed to meet the needs of previously registered nurses who wish to renew their knowledge and current skills of nursing. Because students differ widely in the amount and type of "renewing" required, an individualised, student paced, mastery oriented, learning system has been designed to provide each student with the learning experiences needed in theory and clinical areas. The programs are distance education style, self directed study, which includes theory modules, followed by a learning module for the clinical practicum.

CONCEPTUAL FRAMEWORK

From the inception of nursing until the late 1960's, nursing practice was based on a model which emphasised causes of diseases and treatment based on a medical model. Nursing has broadened its dimensions to include care during illness as well as promotion of health and the prevention of illness. The realisation of the uniqueness of nursing gave rise to nursing models.

The current program is based on a model developed by Grant MacEwan Community College which describes the context of nursing. The recipient of nursing care is the person and the nurse's goal is to help achieve optimal health. Nursing interventions are directed towards the critical periods in an individual's life. The sources of these critical periods are:

- stages of growth and development;
- lifestyle (patterns of living in response to environmental and orgasmic forces);
- unanticipated events (disorders or occurrences unexpected by the individual).

These three critical periods are interrelated and cannot be viewed independently because a person functions as an integrated whole. When giving care, a nurse reinforces appropriate modes of adaptation by preventing, supporting or altering stimuli. Planning of an appropriate mode of adaptation is enhanced by the nurse's physiological, psychosocial and legal ethical knowledge base. With this broad knowledge base, the nurse has the capacity to organise interactions systematically and to demonstrate his or her competence. The curriculum, both the theoretical and clinical components, were developed around this conceptual framework and separated into a series of learning modules.

THEORETICAL COMPONENT

On entry into the program (see diagram 1) the student is orientated to the program. The tutor will outline what is expected as well as the resources (both human and other) that are available to them. After the orientation, the student decides on how s/he plans to progress through the program and writes a learning contract. The student studies the learning modules in the sequence outlined in the learning contract. Self testing is initiated by the student usually after the student has studied the learning module and has successfully completed a post test in the module. The student will go to the learning centre to sit a supervised computer based multiple choice test. If the student does not achieve the 80% pass mark on this test, remediation is advised and the student resits the test until mastery learning of the module is achieved. Computer managed learning in these programs and as described by Van Breugel (1991), uses traditional learning methods such as books, videos, labs and tutorials, but the process is computer managed and paced to suit the individual needs of students.

CLINICAL COMPONENT

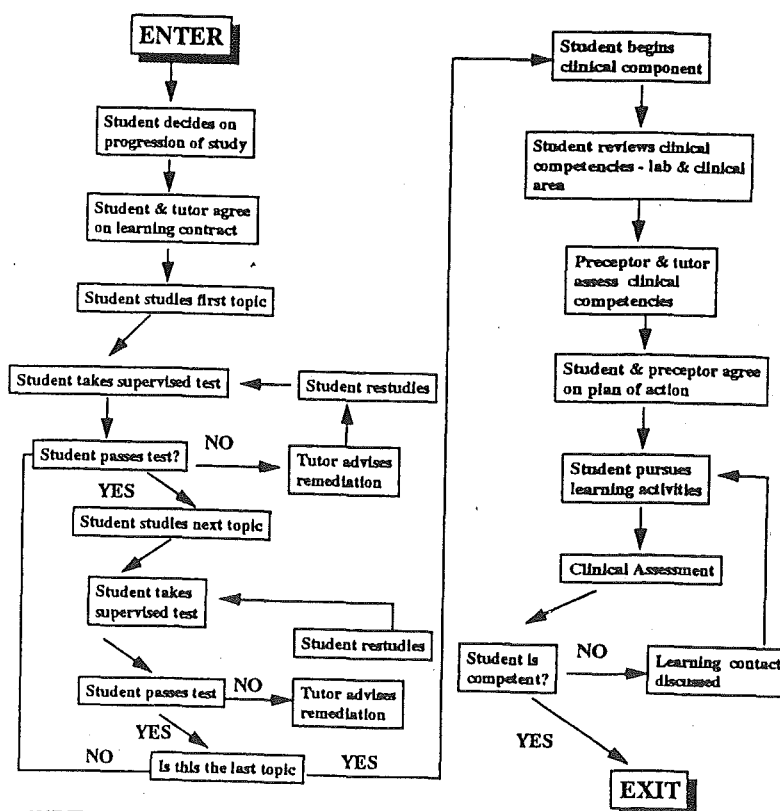
Self-initiated learning is encouraged in the clinical component, in the laboratory before the student commences the clinical practicum as well as the practicum itself. Self-evaluation of nursing competence is also an integral part of the program, promoted by the use of a clinical evaluation tool and anecdotal records. The current clinical evaluation tool has been developed in response to program need evidenced by feedback from NBWA, students, agencies and academics. The evaluation tool has evolved from Australian Nursing Council Incorporated (ANCI) formerly ANRAC, Australian Nursing Registration Authorities Competencies (Parkes 1991, Parkes 1992, Thompson 1991). Evaluation of performance is competency based across five domains:

- professional/ethical practice;
- reflective practice;
- enabling skills;
- problem framing and solving;
- teamwork.

These domains encompass assessment of cognition, affect and psychomotor skills necessary for competent practice in the clinical area (Parkes, 1991).

During the clinical practicum the student works with an experienced clinical practitioner, a preceptor, who is chosen and volunteers for this role. Close liaison between the School of Nursing tutor and the health care agency preceptor is maintained to promote a continuation of self directed learning by the student during the clinical practicum.

RENEWAL OF REGISTRATION PROGRAMS



SOURCE: Adapted from Grant MacEwan Community College (1987)

DIAGRAM 1

EVALUATION OF THE PROGRAMS:

To develop the programs to meet the needs of students and health care agencies, evaluation is continual from student entry through to student employment. Evaluation data is obtained from four distinct points during student contact:

1. application for enrolment - see appendix 1;
2. on orientation - see appendix 2;
3. during the program - see appendix 3;
4. following completion or withdrawal.

A full analysis of all the data generated from these methods of evaluation presented in this paper is beyond the scope of this presentation, however selected points will be used to illustrate significant findings.

1. ENROLMENT DATA

It was of interest to note if age of student was a variable influencing completion of program. There seemed to be no appreciable difference in the age of students who completed or did not complete the program. It was also postulated that migrant students were younger than non migrant students, as illustrated in graph 1. Data from the enrolment application verified this assumption.

What is your year of birth (graph 1)?

1.	Average age of all students	=	43 years
	Minimum	=	61 years
	Maximum	=	24 years
	Total	=	455 students
2.	Average age of non migrant students	=	44 years
	Minimum	=	61 years
	Maximum	=	26 years
	Total	=	407 students
3.	Average age of migrant students	=	34 years
	Minimum	=	50 years
	Maximum	=	24 years
	Total	=	48 students
4.	Average age of students withdrawn	=	44 years
	Minimum	=	59 years
	Maximum	=	24 years
	Total	=	152 students

2. ORIENTATION QUESTIONNAIRE

At orientation each student is given an initial questionnaire to identify possible problem areas the student may encounter through the program. See appendix 2. A few examples of summary data taken from these questionnaires completed by 53 Renewal of General Registration students and 13 Renewal of Midwifery students in 1992 is as follows:

Q 20 Do you think your significant other/s (partner/family) is in favour of you taking part in this program? See table 1.

	GENERAL	MIDWIFERY
YES, TOTALLY	57%	46%
YES, MOSTLY	36%	46%
NOT VERY MUCH	4%	-
NOT AT ALL	2%.	-
NOT APPLICABLE	1%	8%

TABLE 1

Q 21 Can you plan time in your day for uninterrupted study? See table 2.

	GENERAL	MIDWIFERY
ALWAYS	30%	46%
OFTEN	62%	31%
SELDOM	6%.	15%
NEVER	2%	8%

TABLE 2

Q 24 Will you be in paid employment whilst undertaking this program? See table 3.

	GENERAL	MIDWIFERY
YES, FULL	7%	15%
YES, PART	23%	54%
NO	70%	31%

TABLE 3

3. STUDENT FEEDBACK REGARDING LEARNING MODULES

Students evaluate each module following testing which is used to assist with revision of written material. See appendix 3. The modules are constantly under review to accommodate changes in practice and in response to perceived student problems or difficulty.

4. FOLLOW UP EVALUATION

An evaluation form was sent to all students who had enrolled up until October 1993. A total of 132 responses were received, 105 from General students and 27 from Midwifery students. The questions related to completion or withdrawal from the program; theoretical content; clinical component; current working status, and preparation for current employment. See appendix 4. The following tables summarise data obtained in this follow up questionnaire:

Question 2 Did you complete the program? See table 4.

	GENERAL	MIDWIFERY
COMPLETED	70%	59%
NON COMPLETED	30%	41%

TABLE 4

Q 4 Why were you unable to complete the Program (you may circle more than one response)? (Only the most significant reasons are included.) See table 5.

	GENERAL	MIDWIFERY
NOT ENOUGH TIME	52%	73%
DIFFICULTY WITH SELF DIRECTION	41%	0%
WORK COMMITMENTS	68%	73%

TABLE 5

Q 5 Would you restart the program at a later date? See table 6.

	GENERAL	MIDWIFERY
NO	46%	91%
YES	54%	9%

TABLE 6

Q 9 If you are currently working in nursing, in which region are you currently located? See table 7.

HEALTH REGION	GENERAL	MIDWIFERY
METROPOLITAN	64%	56%
COUNTRY	33%	43%
OTHER	3%	-

TABLE 7

Q 10 If you are not currently working in nursing, please indicate the reasons below (could circle more than one response)? These are General Renewal of Registration students. See table 8.

UNABLE TO FIND SUITABLE WORK	30%
UNABLE TO FIND SUITABLE HOURS	20%
WORKING IN A NON NURSING AREA	50%
NOT LOOKING AT PRESENT	20%
DECIDED NOT TO WORK IN NURSING	20%
NOT NURSING DUE TO STUDY	20%
PERSONAL SITUATION PREVENTS EMPLOYMENT	30%
OTHER	20%

TABLE 8

Q 11 Do you consider the program you have completed has prepared you to return to work in that area? See table 9.

	GENERAL	MIDWIFERY
YES	86%	100%
NO	14%	0%

TABLE 9

CONCLUSION

The computer assisted learning programs for Renewal of Registration Nursing students is a flexible method for providing a necessary education program. Graduates are well received in employment areas as indicated by the high number of graduates who obtain suitable employment. In general, feedback from students has been favourable. The programs have provided for the professional needs of nurses, prepared them for return to the workplace and responded to their voices through student evaluation of the programs.

Finally, thank you for your attention and to our students who provided the background statistics.

REFERENCES

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Thompson, M. 1991. *The implementation of the ANRAC competencies: A examination of pertinent issues*. Adelaide: ANRAC.

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APPENDIX 1

Professional Education Services
School of Nursing
Division of Health Sciences



CURTIN

University of Technology
Perth Western Australia

APPLICATION FOR ENROLMENT

COMPUTER BASED EDUCATION PROGRAMS

GPO Box U 1987
Perth 6001
Western Australia
Fax (09) 351 2959

Telephone
(09) 351 2057
(09) 351 2205

Course identification number:(FOR OFFICE USE ONLY)

1 - 6

Please indicate type of application:

(Circle one number)

- | | |
|---|-----|
| Renewal of General Nursing Registration | - 1 |
| Renewal of Midwifery Nursing Registration | - 2 |
| Renewal of Community & Child Health Nursing Registration | - 3 |
| Refresher General (currently registered) | - 4 |
| Refresher Midwifery (currently registered) | - 5 |
| Refresher Community & Child Health (currently registered) | - 6 |
| Community & Child Health Program (initial registration) | - 7 |

7

DETAILS OF APPLICANT

1. SURNAME: _____

FIRST NAMES: _____

2. ADDRESS: _____

_____ POST CODE:

8-11

PHONE NUMBER: _____ Date of birth:

12-17

- | | | |
|----------------------|--------|-----|
| 3. What is your sex? | Male | - 1 |
| (Circle one number) | Female | - 2 |

18

**CHILD HEALTH INITIAL REGISTRATION AND REFRESHER
STUDENTS GO TO Q6**

**RENEWAL OF REGISTRATION STUDENTS
CONTINUE TO Q4**

- | | |
|---|---------|
| 4. a) I have a letter from the Nurses' Board of WA confirming my eligibility for registration following successful completion of this course. (A copy of this letter is attached) | |
| (Circle one number) | Yes - 1 |
| | No - 2 |

19

If your answer is NO, your application CANNOT be accepted and you must contact the Nurses' Board of WA.

- b) As my overseas registration was from a non English speaking institution, I have a certificate of English from the National Office of Overseas Skills Recognition, or similar. A copy is attached.
- | | | | |
|---------------------|--|-----|----|
| (Circle one number) | NOSR certificate | - 1 | |
| | Pass certificate in English (OET or IELTS) | - 2 | |
| | Not Applicable | - 3 | 20 |
5. If applying for Midwifery Renewal of Registration, did you complete the General Renewal of Registration Program?
- | | | | |
|---------------------|-----|-----|----|
| (Circle one number) | Yes | - 1 | |
| | No | - 2 | 21 |
6. a) Will you be attending the Orientation Workshop at Curtin University School of Nursing?
- | | | | |
|---------------------|-----|-----|-------|
| (Circle one number) | Yes | - 1 | |
| | No | - 2 | 22-28 |
- If yes, date:
- b) Country students: Regional Orientation Workshops will be organised if there are a sufficient number of students. If this was available would you attend?
- | | | | |
|---------------------|-----|-----|----|
| (Circle one number) | Yes | - 1 | |
| | No | - 2 | 29 |
7. Which Learning Centre will you be attending for testing?
- | | | | |
|---------------------|---|-----|----|
| (Circle one number) | Curtin (Bentley or Joondalup) | - 1 | |
| | Derby | - 2 | |
| | Geraldton | - 3 | |
| | Albany | - 4 | |
| | Port Hedland | - 5 | |
| | Kalgoorlie | - 6 | |
| | Bunbury | - 7 | |
| | My geographical location prevents me from attending any of the nominated learning centres | - 8 | |
| | Narrogin | - 9 | |
| | Katanning | - 0 | 30 |

8. Post basic experience (*please list*):

DATES	POSITION	LOCATION
eg. 1/65 - 2/66 3/66 - 4/70	Student Midwife Registered Nurse	Queen Charlottes, London Royal North Shore, Sydney

(Attach additional list, if necessary).

9. If you are currently employed in nursing, please state where.

Please complete this form, the enclosed medical declarations, and send with the payment of the course fee to:

Mrs Jo Boycott
School of Nursing
Curtin University of Technology
GPO Box U1987
PERTH WA 6001

Telephone : (09) 351 2205

Application will not be processed without payment of the appropriate course fee.

Signature _____

Date _____

For Office Use Only

DATE	RECEIPT NO.	AMOUNT

APPENDIX 2

CURTIN UNIVERSITY OF TECHNOLOGY SCHOOL OF NURSING

Questionnaire to students commencing a Computer Based Education Program

		Column Number
Identification Number	<div style="display: inline-block; border: 1px solid black; width: 20px; height: 20px; margin: 0 5px;"></div> <div style="display: inline-block; border: 1px solid black; width: 20px; height: 20px; margin: 0 5px;"></div> <div style="display: inline-block; border: 1px solid black; width: 20px; height: 20px; margin: 0 5px;"></div> <div style="display: inline-block; border: 1px solid black; width: 20px; height: 20px; margin: 0 5px;"></div> <div style="display: inline-block; border: 1px solid black; width: 20px; height: 20px; margin: 0 5px;"></div>	

These next three questions (7-10) relate to students who are renewing a lapsed nursing registration (Initial registration students in Child and Community Health proceed to Question 13).

Column
Number

7. How many years is it since you graduated in the area you are seeking to renew? (eg. General, Midwifery or Child Health).
(Complete the boxes - nearest whole number)

18-19

8. For how many years did you work after graduating (in the area you are seeking to renew)?
(Complete the boxes - nearest whole number)

20-21

9. How many years is it since you last worked in the area you are seeking to renew?
(Complete the boxes - nearest whole number)

22-23

Questions 10-12 are to be completed by renewal of general registration students only. Other students, proceed to Question 13.

10. If you are renewing your general registration, what was your major reason for leaving nursing?
(Circle one number)

- | | |
|---------------------------------|---|
| To start a family | 1 |
| Unable to get work as a nurse | 2 |
| Dissatisfaction with pay | 3 |
| Dissatisfaction with conditions | 4 |
| Changed career | 5 |
| Returned to full time study | 6 |
| Other (please specify)_____ | 7 |

24

11. If your initial general registration was not in Western Australia, but an English speaking country, indicate where.

(Circle one number)

- | | |
|-----------------------------|---|
| Another state in Australia | 1 |
| Canada | 2 |
| New Zealand | 3 |
| Britain | 4 |
| Ireland | 5 |
| United States | 6 |
| Other (please specify)_____ | 7 |

(Go to Q13)

25

12. If your initial general registration was NOT obtained in an English speaking country, where was it?

(Circle one number)

- | | |
|-----------------------------|---|
| Phillipines | 1 |
| Malaysia | 2 |
| Singapore | 3 |
| Hong Kong | 4 |
| Indonesia | 5 |
| India | 6 |
| Netherlands | 7 |
| Germany | 8 |
| Other (please specify)_____ | 9 |

26

13. What nursing certificates do you have?
(You may circle more than one response)

- | | |
|-----------------------------|---|
| None | 1 |
| General | 2 |
| Midwifery | 3 |
| Child Health | 4 |
| Mental Health | 5 |
| Other (please specify)_____ | 6 |

27-32

14. Have you been previously registered in any of the following?
(You may circle more than one response)

General	1
Midwifery	2
Child Health	3
Mental Health	4
Other (please specify)_____	5

33-37

15. Do you belong to a nursing organisation?
(Circle one number)

Yes	1
No	2

If yes, name them _____

38

16. Do you subscribe to a nursing publication?
(Circle one number)

Yes	1
No	2

If yes, name them _____

39

17. Please indicate your reasons for undertaking this course?
(You may circle more than one response)

Improved pay levels	1
Improved working conditions	2
Increase employment opportunities	3
Change in career direction	4
Need to be financially independent	5
Family now grown up	6
Chance to do something for myself	7
Looking for a new challenge	8
Other (please specify)_____	9

40-48

This section asks you to rate on a 7 point scale adjectives used to describe nursing. On each line circle **ONE** number that best describes nursing today, in your opinion.

Column
Number

18.1	Training	1 2 3 4 5 6 7	Education	49
18.2	Bases care on doctor's orders	1 2 3 4 5 6 7	Bases care on nursing decisions	50
18.3	Curative	1 2 3 4 5 6 7	Preventative	51
18.4	Disease oriented	1 2 3 4 5 6 7	Wellness oriented	52
18.5	Apprenticeship	1 2 3 4 5 6 7	Profession	53
18.6	Disease/condition centred	1 2 3 4 5 6 7	Patient/client centred	54
18.7	Uses prescriptive approach	1 2 3 4 5 6 7	Uses a problem solving approach	55
18.8	Discourages creativity	1 2 3 4 5 6 7	Encourages creativity	56
18.9	Developed around medical model of health	1 2 3 4 5 6 7	Developed around social model of health	57

This section asks you to rate on a 7 point scale adjectives that could describe you. On each line circle **ONE** number that best describes you.

19.1	Highly motivated	1 2 3 4 5 6 7	Not highly motivated	58
19.2	Well organised	1 2 3 4 5 6 7	Disorganised	59
19.3	Very enthusiastic	1 2 3 4 5 6 7	Not enthusiastic	60
19.4	Active	1 2 3 4 5 6 7	Passive	61
19.5	Self directed	1 2 3 4 5 6 7	Prefer to be directed	62
19.6	Independent	1 2 3 4 5 6 7	Dependent	63

										Column Number
19.7	Adaptable	1	2	3	4	5	6	7	Rigid	64
19.8	Enjoy challenges	1	2	3	4	5	6	7	Don't enjoy challenges	65
19.9	Respond positively to stress	1	2	3	4	5	6	7	Respond negatively to stress	66
20.	Do you think your significant other/s (partner/family) is in favour of you taking part in this program? (Circle one number)									
									Yes, totally	1
									Yes, mostly	2
									Not very much	3
									Not at all	4
									Not applicable	5
21.	Can you plan time in your day for uninterrupted study? (Circle one number)									
									Always	1
									Often	2
									Seldom	3
									Never	4
22.	Do you have a suitable place in your family home in which to study? (Circle one number)									
									Always	1
									Often	2
									Seldom	3
									Never	4
23.	Do you anticipate many social or family interruptions? (Circle one number)									
									Many	1
									Some	2
									A few	3
									None	4
24.	Will you be in paid employment whilst undertaking this program? (Circle one number)									
									Yes, full time	1
									Yes, part time	2
									No	3

APPENDIX 3

MODULE EVALUATION

DATE: ____/____/____

Please complete once you have passed (80% mastery) on each module.
Circle the number which best fits your answer.

Student ID (eg GRM689)

--	--	--	--	--	--

1-6

Module Number

--	--

7-8

Program (Circle one number)

General 1
Midwifery 2
Child Health 3

9

KEY:

Strongly Disagree = 1 (SD)
Disagree = 2 (D)
Agree = 3 (A)
Strongly Agree = 4 (SA)

1. General Design and Organisation	SD	D	A	SA	
1.1 Overall, the module appears to be well organised.	1	2	3	4	10
1.2 The module has made realistic assumptions about my prior knowledge of the subject.	1	2	3	4	11
2. Subject Material					
2.1 Overall, I have been able to grasp the content of this module.	1	2	3	4	12
2.2 The subject material in this module has generally been new to me.	1	2	3	4	13
2.3 In my opinion, the subject material has been treated in suitable depth.	1	2	3	4	14
2.4 An acceptable amount of detailed or technical material is included.	1	2	3	4	15
2.5 I foresee applications of this material in my intended area of employment.	1	2	3	4	16
2.6 I have found the subject material interesting.	1	2	3	4	17

Please turn over the page.....

3. The references/readings were:

Always useful	1
Often useful	2
Seldom useful	3
Never used	4
Not applicable	5

18

In the space below, please write any comments you would like to make about any aspect of the program.

APPENDIX 4

CURTIN UNIVERSITY OF TECHNOLOGY SCHOOL OF NURSING

Questionnaire to students who have enrolled in a Computer Based Education Program

Column
Number

Identification Number

(Complete the boxes)

--	--	--	--	--	--

1-6

1. In which program were you enrolled?

(Circle one number only)

- | | |
|--|---|
| General | 1 |
| Midwifery | 2 |
| Child Health (Initial registration) | 3 |
| Child Health (Renewal of registration) | 4 |

7

2. Did you complete the program?

(Circle one number)

- | | |
|-----|---|
| Yes | 1 |
| No | 2 |

8

If Yes go to Q6.

If No go to Q3

3. How many modules did you complete?

(Complete the boxes)

--	--

9-10

4. Why were you unable to complete the program?

(You may circle more than one response)

- | | |
|---|----|
| Discomfort with computer | 1 |
| Difficulty accessing testing facility | 2 |
| Found modules too difficult | 3 |
| Found content irrelevant | 4 |
| Could not find a suitable location to study | 5 |
| Difficult to allocate enough time to study | 6 |
| Difficulty with self-directed study | 7 |
| Dissatisfaction with staff in the program | 8 |
| Other study commitments | 9 |
| Work commitments | 10 |
| Lack of support from significant other(s) | 11 |
| Personal circumstances | 12 |
| Other (please specify) _____ | |

11-27

13

5. Would you like to restart the program at a later date?
(Circle one number)

Yes 1
No 2

28

Please go to Q.12.

Questions 6 to 11 relate to students who have completed the program.

6. This section relates to the THEORETICAL COMPONENT of the program. You are asked to rank your feelings on the statements below. Please circle **one** number for each statement.

KEY: 1 = Strongly Agree SA
 2 = Agree A
 3 = Unsure U
 4 = Disagree D
 5 = Strongly Disagree SD

		SA	A	U	D	SD	
6.1	Overall, the modules were difficult	1	2	3	4	5	29
6.2	The modules were relevant	1	2	3	4	5	30
6.3	The modules were well organised	1	2	3	4	5	31
6.4	The terminology was difficult to understand in the modules	1	2	3	4	5	32
6.5	The terminology was difficult to understand in the videos	1	2	3	4	5	33
6.6	The terminology was easy to understand in the textbook	1	2	3	4	5	34
6.7	The audio tape(s) was useful	1	2	3	4	5	35

						Column Number	
7.	This section relates to the CLINICAL COMPONENT of the program. You are asked to rank you feelings on the statements below. Please circle one number for each statement.						
KEY:							
1	=	Strongly Agree	SA				
2	=	Agree	A				
3	=	Unsure	U				
4	=	Disagree	D				
5	=	Strongly Disagree	SD				
			SA	A	U	D	SD
7.1	The length of the preclinical workshop was appropriate.					36	
	1	2	3	4	5		
7.2	The preclinical workshop was helpful in preparing me for clinical practice.					37	
	1	2	3	4	5		
7.3	The clinical placement provided me with enough opportunity to practice my nursing skills.					38	
	1	2	3	4	5		
7.4	The clinical placement provided me with enough time to feel competent in the clinical area.					39	
	1	2	3	4	5		
7.5	After the clinical experience I felt confident in my nursing practice.					40	
	1	2	3	4	5		
7.6	My preceptor(s) were helpful in the clinical area.					41	
	1	2	3	4	5		
7.7	The staff at Curtin School of Nursing provided adequate support during my clinical practicum.					42	
	1	2	3	4	5		

8. If you are currently working in nursing, where is it?
(Circle one number)

Large public teaching hospital (RPH, SCGH, Fremantle, RPH(R), PMH, KEMH)	1
Private hospital (SJOG, Mount Hospital, St Annes, Glengarry, Attadale, Kaleeya)	2
Public Hospital (Albany, Bentley, Osborne Park, Swan Districts, Mount Henry, Kalgoorlie)	3
Community health (child health, school health, home care, occupational health)	4
Nursing home (Homes of Peace, Craigville, Rowethorpe)	5
Agency (AAA)	6
Other (please specify)_____	
_____	7

43

9. If you are currently working in nursing, in which health region are you located?
(Circle one number)

Metropolitan	1
Great Southern	2
South West	3
Goldfields	4
Central Wheat-Belt	5
Mid-West Gascoyne	6
Pilbara	7
Kimberley	8
Other (please specify)_____	9

44

10. If you are not currently working in nursing, please indicate the reasons below?
(You may circle more than one response)

Unable to find suitable place of employment	1
Unable to obtain suitable hours of work in nursing	2
Working in another area (non nursing)	3
Not looking for work at the moment	4
Decided I do not want to work in nursing	5
Other study commitments (e.g. Degree conversion)	6
Personal situation prevents employment	7
Other (please specify)_____	
_____	8

45-52

11. Do you consider the program you have completed has prepared you to return to work in that area?

Yes 1
No 2

53

If no, please give reasons _____

12. Please feel free to make any further comments regarding any aspect of the program.

Thank you for your time in completing this questionnaire. Please place the completed form in the envelope provided and return to the School of Nursing, Curtin University of Technology.

**STUDENTS' PERCEPTIONS OF TECHNOLOGY IN DISTANCE EDUCATION
- A PRELIMINARY REPORT**

ABSTRACT

There has been a great increase in the technologies available in the higher education sector in recent years. Just because the technology is available however, doesn't necessarily mean that we ought to use it, without reference to students' needs and expectations.

Using a sample of Curtin University distance education students, we set out to determine student perceptions of the use of technology in distance education in terms of their access, how useful they believed the technology would be for them and any difficulties they had already, or might in the future, encounter.

Preliminary results have indicated that for the majority of students, communication technologies were the most important for them and that they wished to use technology as a support for learning, rather than have technology become a major part of their courses.

INTRODUCTION

With the current Government's push towards developing Open Learning and Distance Education as a means of providing increased access to higher education for less cost (Ashenden, 1987), the numbers of subjects being offered in the 'distance mode' are increasing. Unfortunately there has not been a concomitant increase in research on what is the most appropriate way to produce and deliver these subjects. With the availability of new technologies, there tends to be an automatic assumption by some unit developers that they should be used and that technologically delivered courseware is somehow better (Bowser & Shepherd, 1991). Clark, quoted in Russel (1992; p. 2) stated "...media are mere vehicles that deliver instruction but do not influence achievement any more than the truck that delivers our groceries causes changes in nutrition". The increased use of technology in distance education makes the assumption that there is easy access, availability of equipment and that the students actually want technology to be a part of their courseware (Bowser & Shephard, 1991).

It was the aim of this study to determine the accuracy of these assumptions. A survey was developed which asked distance education students from Curtin University about:

- their access to 24 different types of technologies including radio, telephone, fax, audio and video recorders, television, videoconferencing equipment, computers, software and CD-Rom
- their perceptions of how useful these technologies would be in their studies
- the most difficult aspect they found in using technology.

This last point was framed as an open-ended question. The analysis of the responses to this question, forms the basis of this preliminary report.

METHOD

Curtin University has a Distance Education population of about 2,500 students. A questionnaire asking the students about their perceptions of technology in distance education was sent to each of them at the beginning of 1993, with an accompanying letter explaining the background of the study.

The questionnaire also provided information on their area of study, residential location, length of enrolment and access to learning centres. As well as indicating that the respondents approximate, at the broad level, the Curtin distance education population, this information should also help to determine if the needs of a diverse range of students are different.

A total of 887 survey forms (35%) was returned, which was considered acceptable. Responses to the open-ended question "The most difficult aspect I find in using technology in education is ..." were noted, categorised and tabulated on a school by school basis. An analysis of the data indicated trends within and between students from certain schools, as well as from students residing in different localities. Some overall conclusions about the students' perceptions of technology in education could also be drawn.

RESULTS AND DISCUSSION

It can be seen from Table 1 that access to technology was the most important single issue for students with 35% responding that they found this a difficult aspect. One in four students commented that knowledge on how to use the technology and finding out what was available and where was an issue for them. The fact that technology wasn't being used sufficiently, or properly, to reduce feelings of isolation was mentioned by 18% of students. A number of students (15%) commented that they felt that time taken to learn to use a piece of technology, or for rural students, time taken to travel to access the technology detracted from its appeal. Eleven percent of students noted that the level of use of technology didn't match their preferred learning style. Half of these students (from the School of Business) indicated that they wanted greater use of technology i.e. computers, while the other half (predominantly from Nursing and Social Science) responded that they disliked using technology and having to use it increased their level of stress. The affordability of technology, including hardware, software and phone and fax costs (for rural students) was a deterrent for 10% of students. Surprisingly in this time of 'Quality' initiatives, quality in technology was only an issue for 8% of students. Most of this group of students were concerned about technical failures of the technology such as satellite linkage breakdowns, and audio tapes that couldn't be heard clearly. Less than 1% of students complained about software quality ("Garbage in equals garbage out"). Does this mean that it is good or does it mean that the students simply accept what they are given? Seven percent of students commented that they would like to see improved library facilities, with modem connections from rural libraries to the central Curtin library, and greater access to CD-Roms and photocopiers, out of work hours.

As mentioned, there did seem to be some basic differences between the students from different schools. Students in business courses seemed less concerned about having tuition in the use of technology; they had no problems adjusting to new technology; affordability seemed less of an issue; and they seemed keen to become involved with more material that utilised technology. These factors are probably to do with the more material that utilised technology. These factors are probably to do with the expectations of those in the business sector, that computers and technology are a necessary part of the field. On the other hand, students from Schools such as Nursing and Social Science seemed more concerned about having a tutor or support group available to help with learning how to use the technology and made comments that they found it hard to adjust to using 'new' technology such as CD-Roms and computers. These students also tended to be from the older age groups.

Table 1: Open-Ended Responses (% total responses)

	Bus	Nur	SS	Lib	Ed	PH	SW	Other	Total
Access									
-to hardware and/or software	32	30	26	40	25	30	40	19	30
-more facilities such as CD-Roms & Photocopiers	1		4	7	6	5		3	3
-continued use for revision				2				2	1
Knowledge									
-to use the technology	13	40	23	15	7	17	12	7	17
-to use it effectively	3	3	2	4	4	6	36	5	5
-of what is available & where	3	2	4	5	3	3	4	2	3
Isolation									
-lacks direction, feedback	6	7	14	4	4	3	12	5	7
-wants more tutor contact	8	9	6	8	4	9	16	6	7
-feeling that missing vital info so wants taped lectures	6	4		1	3	3		1	3
-interstate/OS problems	1		2			1			1
Time									
-to learn to use it	4	4	5	6	10	1	4	4	5
-to use it	4	4	5	2	6	2	4	3	4
-taken in travelling to get access	1	1	1	2			4	2	1
-to be available at set times for broadcasts etc	3	5	3	5	8	7	4	3	5
Learning Strategies									
-tech not used but wanted	11	1	1	2	4	2	8	4	4
-problems adjusting (older)		6	6	5	4	6	1	2	3
-prefers print material	3	2	2	3	3		4	2	2
-poor tutor attitudes	4			2		2		3	2
Affordability									
-of hardware and software	6	5	9	8	12	10		9	8
-phone & fax costs if remote	1	2	3	2	2	3	8	1	2
Quality									
-of software	2	1		6	4	1		2	2
-of audio/video tapes		1	7	5	2	1	4		3
-technical failures - hardware, software, remote transmissions	3	4	3		7	2	1	3	3
Library Services									
-lists of avail software/videos	1	1	2	1	3	1		2	1
-availability outside work hrs	7	9	6	6	1	6	8	7	5
-access through local library	1		2	1		1			1

Key: Bus: - business Nur - nursing SS - social science Lib - library Ed - education PH - public health SW - social work

The use of the word 'technology' was very much open to individual interpretation in this survey. Students from the different subject disciplines used 'technology' to suit their own subject requirements. For example:

- metropolitan students who had access to the Curtin library tended to be referring to the availability of CD-Roms and photocopiers when they spoke of access to technology, especially in the areas of library studies, public health and education
- business students usually meant personal computers when referring to technology
- rural students without access to on-campus lectures and tutorials, or other students, were keen to use the 'technologies' of tape and video-recorders, tele- and video conferences, because they felt that they were 'missing-out' and wanted the same material as their on-campus colleagues, and more tutor contact
- remote students seemed to be very concerned about satellite linkages for TV, radio, fax and phone, and because of breakdowns tended not to trust or use technology, suggesting that for them, print materials were the best option. This is also true for the interstate and overseas students.

Isolation seemed to be an important issue to many students across the board, but particularly to the rural students, increasing their desire for the use of technology - especially 'human contact' equipment such as the telephone. Most students wrote that they would like more contact with their tutors, either written, by phone, through audio or video tapes, through tele or video-conferencing or through CMC. Partly they wanted feedback on their assignments and partly on the use of computer software, where this was new to them (particularly in the health and social sciences). The students also felt that increased communication would increase their motivation and make them feel part of the University as a whole. Lauzon (1991) found in a study of external students from the University of Guelph in Canada, that a lack of human contact produced an unacceptable attrition rate amongst the students and negates the whole notion of learning being partly a social process.

Personal experiences with technology obviously will reflect preferences for future courses. It was interesting to note that as mentioned, a number of students said they would like to be involved in audio and videoconferences to get some personal contact, exchange ideas and get instantaneous feedback. The 5-6 students however who had used this technology said it was 'nerve-racking' and not really worthwhile. This may say something about the way it was used rather than the technology itself. It also indicates the importance of academic staff development and training, where new technologies are being introduced into a course package.

CONCLUSIONS

Three major points have arisen from the analysis of the survey open-ended questions:

- **Definitions of Technology**
Students from different disciplines and from different localities, have quite different definitions of "technology".
- **Communication technology**
For the majority of students, it seemed that communication technology was more important to them than the development of highly technical courseware.
This is not surprising given the research which indicates that all learners, but particularly adult and mature-age learners, put feedback as one of their highest needs (Candy, 1991) and one which usually falls short of their wants and expectations (Ramsden, 1992).

- Support for Learning

From our results so far we can infer that for at least this population of students, they wish to see technology used as a support for learning, rather than for technology to take the place of their tutors and unit controllers.

When we have fully analysed all of the survey data and conducted follow-up telephone interviews with selected students, we can determine more carefully and in an informed way what students want, and the best way to give it to them. As Instructional Designers we can then encourage those people developing or updating distance education courseware to ensure that the human element is not lost in a barrage of 'you-bewt' 'gee-whizz' course packages, but that technology is used thoughtfully, with the overall objective of improving student learning in mind.

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**MINITESTS IN MEDICAL LABORATORY SCIENCE:
MAXIMUM GAIN, MINIMUM PAIN**

ABSTRACT

All first year students enrolled in the first year of the Bachelor of Science (Medical Science) and Associate Diploma in Medical Laboratory Techniques complete the units Medical Laboratory Science 131/132. These units have a large practical component. A programme of minitests was introduced into this component in an effort to encourage the students to familiarise themselves with the necessary background prior to each practical session. A number of positive outcomes were achieved as a result of this programme. The students found that in return for a relatively small investment of time, they gained a great deal in terms of understanding the purpose of the practicals and reinforcing the theoretical concepts behind the practicals. Teaching staff reported an improvement in the level of competency and problem solving skills shown by students. In terms of teaching and learning, the minitest programme results in maximum gain with minimum pain.

INTRODUCTION

Medical Laboratory Science (MLS) 131/132 are the major professional units undertaken by all first year students enrolled in the Bachelor of Science (Medical Science) and Associate Diploma (Medical Laboratory Techniques) courses conducted by the School of Biomedical Sciences at Curtin University of Technology. These courses are designed for students seeking a career as a scientist or technical officer in a clinical pathology laboratory. The combined intake for these two courses is 80 students annually.

By necessity, MLS 131/132 have a large practical component. The students are divided into four groups of 20 students. Each group completes a total of 20 practical exercises, each of 2 hours duration, during each semester. Attendance at all sessions is compulsory. The practical exercises are designed to familiarise the students with a wide range of basic laboratory skills. Practical sessions are also important in reinforcing theoretical concepts introduced during formal lecture sessions.

Time constraints make it difficult to precede each practical with a detailed prelab session. In an effort to compensate for this, the practical manual was reworked in 1991 to include a detailed one page introduction to each exercise. This introduction provides the students with all the necessary background for each practical session, revising the underlying theory of, introducing principles and applications relevant to, each practical topic. The students were requested to familiarise themselves with this material prior to each session.

It was noted that students were not gaining the maximum benefit from these practical sessions. Tutors were spending much time going over basic background material in an effort to make the aims and objectives of the various practical exercises clear to the students. This could be attributed mainly to the fact that the majority of students spent little or no time preparing for the practical sessions and were consequently disorganised and unfocussed when performing the required exercises.

THE MINITEST PROGRAMME

To combat this problem, a programme of minitests was introduced.

Minitests are short written tests consisting of five questions based on both theoretical and practical aspects of the practical exercises. The information assessed by these minitests is contained within the introduction to each practical. Students are presented with a minitest at the beginning of a practical session and allowed a maximum of 10 minutes to complete the paper. The papers are then collected and a brief prelab giving the answers to the minitest questions is held. Students are tested on 10 of the 20 practicals in a random fashion over the course of one semester. The minitests comprise 10% of the final mark for the unit.

A programme such as this requires very little time to set up and implement. The main effort comes in the initial stages and involves setting the questions and establishing a testing schedule.

Using the information in the practical manual as a guide, it is a relatively simple matter to formulate the required number of questions and establish a testbank. A range of different types of questions were set including:

- true/false
- completion of the sentence
- give a definition
- write an equation.

No single question required more than a one sentence answer.

The testing schedule was drawn up to meet the following criteria:

- each practical group complete a total of ten (10) minitests
- no more than two practical groups are tested on any one practical exercise
- the scheduling of tests in totally random.

The students are required to return their papers for assessment after completing the test. The papers are not returned to the students. This means that the questions and testing schedule, once established, can be used in future years.

ASSESSMENT OF THE PROGRAMME

The response of tutors who have been involved in the practical component of MLS 131/132 both before and after the introduction of the minitest programme was obtained by informal interview.

The response of the students was determined by circulating a questionnaire towards the end of second semester. The response rate was a very pleasing 90% (54 students out of 60).

OUTCOMES OF THE MINITEST PROGRAMME

Due to the large number of students enrolled in MLS 131/132, it was necessary to examine two groups of students on any particular practical exercise. Since these two sessions were timetabled on different days, two versions of each minitest were required to prevent students in one group passing on the questions to those in other groups. Although great care was taken when formatting the

minitests, there was some concern that the degree of difficulty could vary between the two versions of the same test, giving some groups an unfair advantage. A correlation coefficient was calculated by comparing the mean score for the different versions of each minitest and value of 0.790 was obtained. A paired t-test showed no significant difference between the mean scores of the different versions of the tests ($p < 0.005$). Together, these results indicate that the different test versions were comparable in terms of degree of difficulty.

The unit coordinator and tutors involved in teaching the practical component of MLS 131/132 found a noticeable improvement in the overall performance of the students under the minitest programme compared with previous years. The students were more organised and had a reasonable idea of what the practicals entailed and what the expected outcomes were. As a result, tutors were spending less time on explaining background material with which the students should have been familiar. There was also an increased tendency for the students to discuss and solve problems themselves, although this cannot necessarily be attributed wholly to the introduction of the minitest programme.

Students were asked if they would bother to preread the practical exercise if not for the minitest programme (see Figure 1). Less than one quarter indicated that they would preread the exercise with the bulk of the students saying that they would not bother to do so on a regular basis (15%; 8/54), and many of these not at all (61%; 33/54). This result indicates a distinct lack of motivation, probably due to the fact that all students can see no obvious advantage in spending time on preparation when they are not going to gain from it in the terms of marks toward their final grade. This goes a long way to account for the poor performance of other students in previous years.

If you didn't have minitests, would you bother to preread the practical exercises?

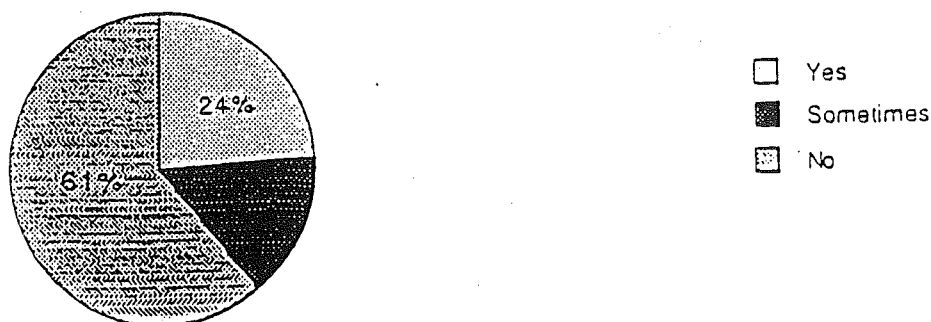


Figure 1. Pie Chart showing the number of students who would prepare for practical sessions in the absence of the minitest programme.

Students were asked how often they prepared for a minitest with 100% meaning that they preread each of the 20 practicals per semester and 0% indicating no preparation for any. The results are shown in Figure 2 below:

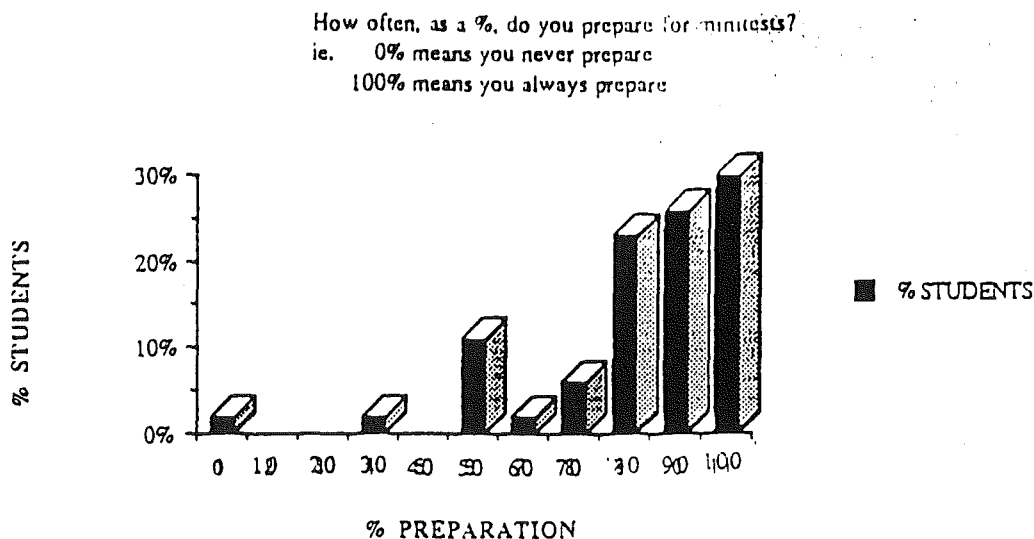


Figure 2: Bar chart showing the frequency (as a %) with which students prepare for a minitest

It is interesting to compare these results to those previously mentioned. Although the number of students prereading all 20 exercises did not increase markedly (24% to 30%; 13/54 to 16/54), the proportion doing at least some preparation showed a dramatic rise from 15% (8/54) to 70% (38/54). 61% (33/54) of the students said that they would not bother to prepare for any of the practical sessions in the absence of the minitest programme whereas only one (2%) took this option when the programme was in operation. The fact that the minitest results were included in the overall assessment for MLS 131/132 evidently provided the students with the motivation to undertake the necessary preparation.

The students found that they gained more than marks by doing some preparative work. The majority agreed that prereading the practical was beneficial with 98% (53/54) agreeing that they were better for the session as a result. When asked to indicate on a scale of one to ten how great this benefit was, the following results were obtained:

On a scale of 0 (lowest) to 10 (highest), indicate how much you benefit from minitests.

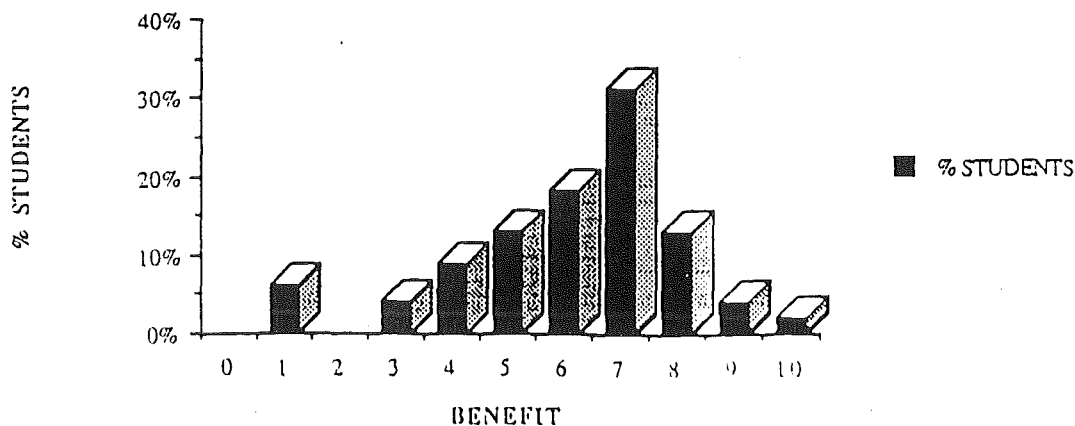


Figure 3: Bar chart showing the beneficial effect of the minitest programme, as perceived by the students.

This shows that the majority of the students perceived a very real advantage in prereading the practical exercises.

93% (50/54) of students felt that the minitest programme was worthwhile. When asked to give one reason for this, a variety of responses were obtained. These were grouped and are shown in figure 4 below, along with typical comments:

Why do you think the minitests are worthwhile?

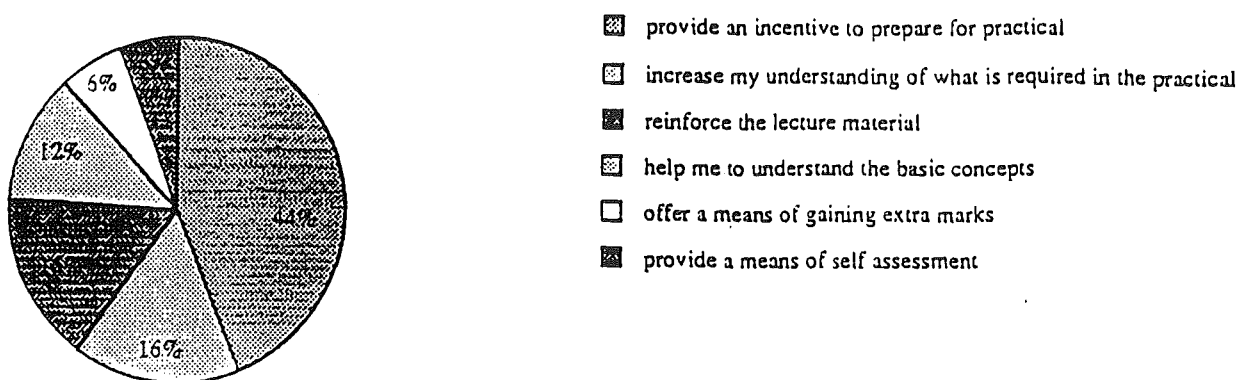


Figure 4: Pie chart showing the major benefits of the minitest programme.

Minitests:

- provide an incentive to prepare for the practical (44%; 22/50)
"they help to prepare you for the pracs so that you gain the most out of them. You know what you are doing"
- increase my understanding of what is required in the practical (16%; 8/50)
"I try to understand what is required before I do the prac so that I know what to expect and know whether I have made a mistake before it is too late"
- reinforce the lecture material (16%; 8/50)
"by preparing for the minitests, we are able to tie theoretical knowledge in with what happens in the practicals, so we know the reason behind the prac"
- help me to understand the basic concepts involved (12%; 6/50)
"they underline the basic concepts involved in the pracs and as a result, the pracs make more sense"
- offer a means of gaining extra marks (6%; 3/50)
"minitests are an easy, stress-free way to obtain marks, provided you have prepared for them"
- provide a means of self assessment (6%; 3/50)
"allow me to assess how well I know my work. If I don't do well in a minitest, I know that I have to go back and revise the principles behind that particular prac."

A small number of students (7%; 4/54) felt that they did not benefit from the minitests:

"I never pass"

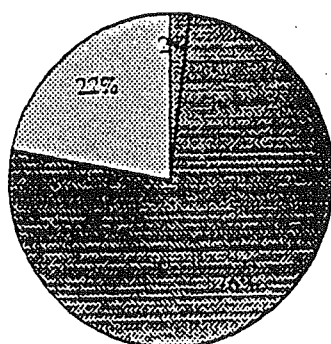
"I waste time memorising the prac rather than just reading it for general knowledge and understanding" (2 students)

"Because at the beginning of the prac you tell us all about the prac anyway"

The advantages of the minitest programme as perceived by the majority of students can only be of true benefit if the costs involved in terms of time are not disproportionately large. This applies to when and how long the students spend preparing for the minitests.

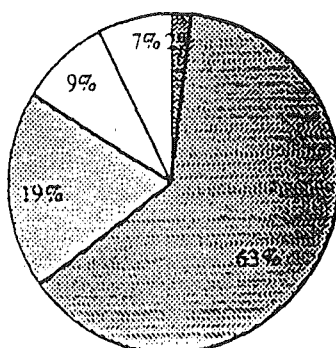
As can be seen in figure 5 below, most students utilise the time immediately before the practical session to do their preparation, spending around 10 minutes reading through the relevant information in their practical manuals. As the practicals are held either first thing in the morning or immediately after a lunch break, it would appear that this preparation encroaches very little on the overall study programme of the students.

(a) When do you usually prepare for the minitests?



- Never prepare
- Immediately before prac session
- Day/evening before prac session

(b) How long on average do you spend preparing for minitests?



- Never prepare
- Less than 10 minutes
- 10-20 minutes
- 20-30 minutes
- More than 30 minutes

Figure 5: Pie charts showing (a) when and (b) how long students spend preparing for minitests.

To determine whether the students felt that this amount of preparation was adequate, they were also asked how much time they felt required to gain full marks in the minitests.

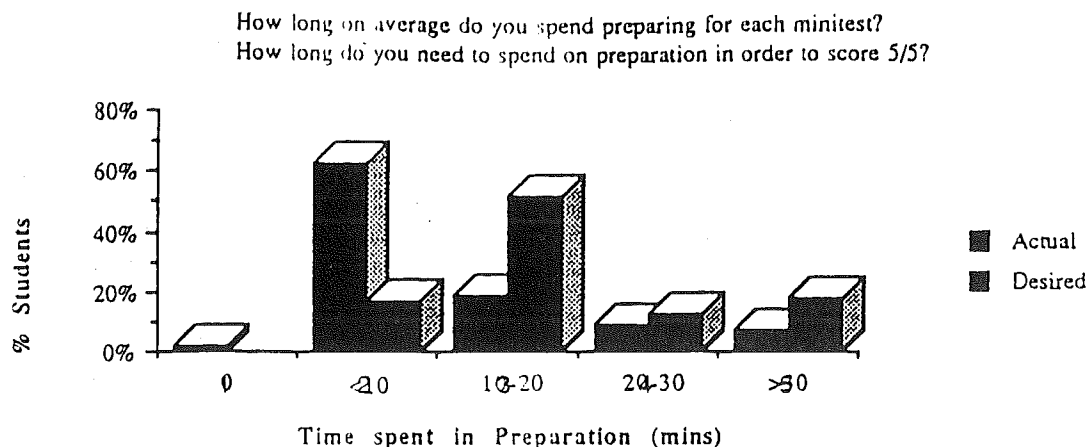


Figure 6: Bar chart showing comparison between time spent preparing for minitests and the amount of preparation time necessary to gain maximum marks.

Most students felt that they needed to do a little more preparation than they currently were in order to gain maximum marks but were satisfied with their current performance in terms of the marks obtained.

Students' perceptions regarding the manner in which the minitest programme was run were determined. There was a high degree of satisfaction in terms of the types of questions asked, with 94% (51/54) indicating that the questions were fair.

The degree of difficulty of the questions was also assessed. Most students rated the questions as relatively easy when they had studies beforehand (see figure 7(a)). However, most students agreed that some preparation was necessary as the overall degree of difficulty (ie. regardless of whether or not they had bothered to prepare) was somewhat greater (see figure 7(b) and (c)).

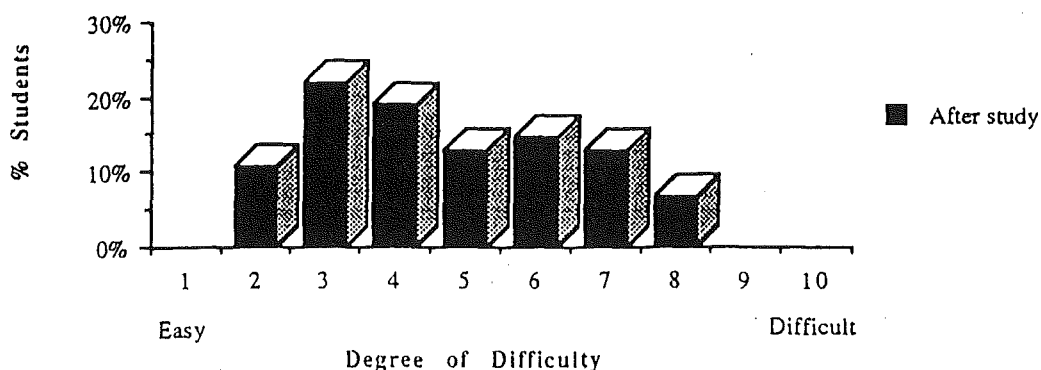
It was found that students could always (48%; 26/54) or sometimes (50%; 27/54) answer at least one question on the minitest paper, even if they had not prepared for it. This improved the attitude of students towards the programme.

Most students were happy with the random nature in which the minitests were given with 78% indicating that the method was fair. A number of students were of the opinion that they should be told when they were to be given a minitest so that they could study for it, which rather defeats the purpose! 73% of students stated that they found it difficult to predict whether they would have a minitest in a particular practical session.

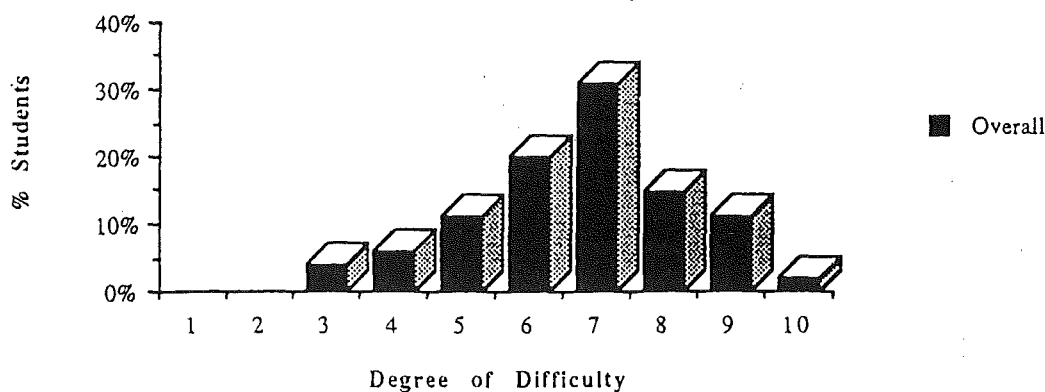
Opinion on whether minitest offered an easy way of gaining marks towards the final assessment was divided, with 46% (25/54) students agreeing and 54% (29/54) disagreeing with this statement. The definition of 'easy' was taken to mean that marks were awarded without students having to expend a great deal of time and effort on a particular task. After some discussion, the overall consensus was that marks were easy to achieve provided that some time had been spent in preparation.

All but three (7%) students found that the minitest programme helped to reinforce the theory from the lecture series.

(a) Assuming that you have prepared for the minitests, how would you rate their degree of difficulty?
Use a scale of 1 (easy) to 10 (difficult)



(b) Using the same scale, how would you rate the degree of difficulty of the minitests overall?



(c) Combined Data

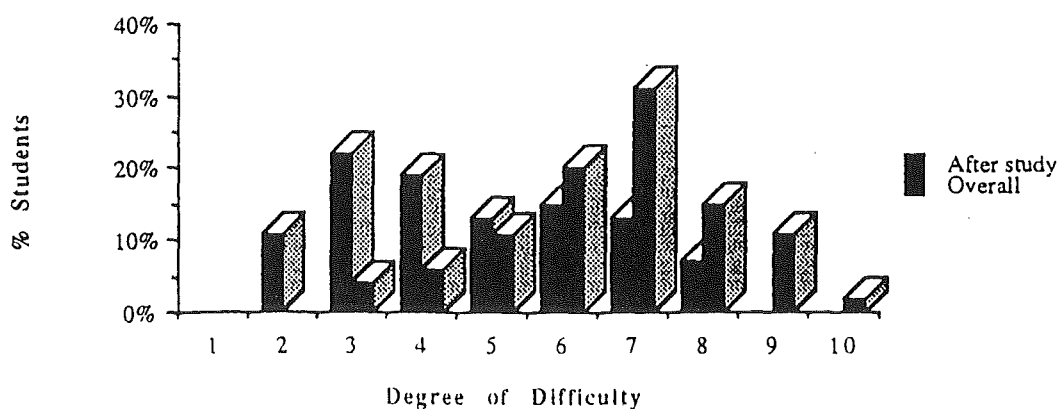


Figure 7: Bar charts showing the degree of difficulty of the minitests (a) after preparation and (b) overall. This data is combined and shown in (c).

SUMMARY

This programme provides maximum gain in terms of:

- improvement in student performance.
Most importantly, the students have demonstrated a greater understanding of the concepts behind the various practical exercises. This in turn has led to a notable improvement in the manner in which the students tackle these exercises and a higher number of students gaining a satisfactory grade for the practical component of the unit. It is however very difficult to measure any effects in a quantitative manner due to changes in the content of the practical component and differences in the ability of the students entering the course.
- more effective teaching.
This programme frees tutors up to lead the students forward instead of going over ground they should have already covered.
- identification of students with difficulties in a particular area.
The minitest programme is a form of continuous assessment. Constant monitoring of a student's performance via their minitest results makes it a simple matter to give the students immediate feedback and to clarify any problems that a student may be experiencing with a particular topic.

These benefits are achieved with minimum pain in terms of:

- the effort required from the students.
The students found that in return for a relatively small investment in terms of the time spent preparing for practical sessions, they gained a great deal in terms of understanding the purpose of the practical exercise and reinforcing the theoretical concepts behind the practical. As an added bonus, there was the potential to gain marks fairly easily if the time spent on preparatory work was adequate. The minitest programme seems to have provided the motivation for preparation that was lacking in previous groups.
- the effort required from the teaching staff.
The programme, once established, is easy for the unit coordinator and tutors to administer and assess. The brevity of the answers to the minitest questions means that very little time is taken up in assessing the papers, with twenty papers taking around ten minutes to mark.

Study immediately before a test does not often result in long term recall of the information being assessed and this is a possible disadvantage of the minitest programme. However, the students are required to apply background knowledge when trying to solve problems and comment on their practical results and this could help to reinforce this information.

Perhaps the last word should go to one of the students who, when asked for any further feedback on the minitest programme, stated that I should

"keep them up to torture next year's students".

THE ELECTRONIC LECTURE

ABSTRACT

The paperless office may have turned out to be a myth, but the paperless lecture is, or rather should be, a reality. Despite the vast range of technical resources available for use in teaching and learning, we all know that the most widely used by far continues to be the trusty old Overhead Projector with its acetate slides - often hand written. Many academics do make use of computer-based technology in the form of Presentation Graphics to prepare high quality slides for conferences and other special presentations. However, they regard this technology as too time consuming, too difficult, or too expensive to use in their everyday teaching activities. This was certainly the case in the past. Over the last twelve months however, the technology has matured to the point where it is quicker, easier, and less expensive to use than the traditional alternatives. Once prepared, lectures can be presented electronically via video overhead facilities, or via large TV screens, or using datashow facilities. The lectures, and other supplementary course materials can be made available on the computer networks for students, to view, copy, print, and edit according to their own requirements, and at any time they wish, both prior to, and following lectures. In the Department of Information Systems at Edith Cowan University several lecturers have been using these techniques and facilities over the last semester. Through questionnaires and class discussions we have found that the overwhelming majority of students favour this style of presentation, and welcome the flexibility provided by the electronic distribution of lectures and course materials. With improved telecommunications, and the emergence at Edith Cowan University of the Virtual Campus, we believe that electronic distribution of learning materials has the potential to greatly assist both staff and students who are involved in distance learning programs.

INTRODUCTION

Despite all advances in technology, the most widely used visual aid is still the overhead projector. It is considered simple, straightforward to use, and is generally readily available in every teaching room.

One of the problems with traditional overheads is that once created, they take time and effort to edit or update. This often means that lecturers continue to present overheads with spelling or typing errors, as well as overheads which contain out of date information. It is also unusual to see graphics or illustrations on traditional overheads unless they have been photocopied—which often means poor quality, drawn by hand or provided by a graphic designer. With desktop presentation software it is a very simple procedure to include a wide variety of clipart, ranging from maps to cartoons, graphs and charts.

One of the great benefits of desktop presentation software is the amount of control that the lecturer has over the whole process—from start to finish, and the high quality output which is available to those who use such software. In the School of Management Information Systems at Edith Cowan University some of the lecturers have been using the paperless lecture, using Microsoft PowerPoint and a variety of projection devices. We have surveyed the students and their comments are elaborated upon later in this paper.

We also aim to implement some of the paperless lecture techniques with our external students.

2. LECTURER'S VIEWPOINT

2.1. Advantages

- o **Time-** One of the biggest incentives to using desktop presentation software is the enormous productivity savings. The lecturer will no longer have to word process the overhead, photocopying on any required graphic images, then feeding the sheets through the thermal overhead machine. The overheads need to be kept in order and may even need to have page numbers marked on them, and any changes made require the overhead to be reprinted and copied.

Of course if the overhead has been handwritten, a minor alteration may require the lecturer to completely rewrite the overhead.

- o **Quality of Presentation-** Lecturers all want to present a professional image and one of the key elements of a high quality presentation is the standard of visual aids.
- o **Economic considerations-** The paperless lecture has the potential to save money, both in the cost of foils and the cost of printing.
- o **Ecological Considerations-** The paperless lecture will also effect considerable savings to the environment in terms of paper and acetate foil wastage.
- o **Portability and Mobility-** When lecture rooms are properly set up, the paperless lecture becomes extremely convenient, requiring only a laptop computer with the presentation stored on it and either a pc/tv adaptor (which costs between \$300 and \$30,000, for example the Video Expert PV-680 provides high quality tv images for a cost of \$570 ex tax) or a pc/video adaptor (for example the Inline 2000 RGBS interface between pc and video projector costs \$850 plus cable \$150 plus RGBS cable \$60, available from Optel Audio Visual).
- o **Team Teaching-** When lecturers are involved in team teaching, overheads no longer have to be reproduced in multiple copies. The entire presentation can be Emailed or provided on diskette to other members of the teaching team, allowing them to adapt the presentation to their own particular teaching styles, whilst retaining common content.
- o **Handouts and Notes-** Providing students with handouts becomes a simple matter as most software allows pages to be printed with multiple slides to a page. The lecturer may attach notes to each overhead either for his or her own benefit or for distribution to students.

Copies of the presentation may be placed on the computer network for easy access by students thereby saving on paper and photocopying costs.

2.2 Disadvantages

- o **Timing-** A major disadvantage is that it is easy to lose track of the timing of the lecture as, unless the presenter knows how many slides are in the lecture, there is no pile of slides to act as a guide. It is also very difficult to add or subtract slides if the lecture needs to be extended or shortened although slides can be skipped quite easily.

- o **Lighting-** The reduced lighting in the lecture room can mean that the lecturer loses eye contact with the students and cannot be as responsive to student reactions.

2.3 Implications

Lecturers will need to come to terms with computers and technology. Every new version of software makes it easier for the novice to master the technology and most desktop presentation software now is easy to learn and improving all the time. The computer hardware needed for the paperless lecture is also becoming more widely available and affordable and is not difficult to use. For example we use an IBM Thinkpad 750 which cost \$4,000 (ex tax) and Microsoft PowerPoint 3, and Macintosh SE/30 or LC with Microsoft PowerPoint 4.

It is currently commonplace for lecturers to keep their own overheads and when they leave the institution, or even cease to teach a unit, they take these overheads with them. The use of desktop presentation software means that a common pool of lecture materials can be retained for future use or adaptation by other lecturers, thereby ensuring continuity and uniformity of information.

3. STUDENTS' VIEWPOINT

Even the best motivated of students are interested in teaching techniques which will aid their learning or enable them to concentrate on what is happening in their lectures. One of their biggest criticisms of lecturers is the quality of presentations, with the overheads containing far too much information, using small, unreadable print, and generally having uninteresting formats. Student perception of the amount of effort expended by their lecturers is determined initially by the quality of the overheads.

With a vast quantity of clipart available, either via the software itself or from shareware products, it is now quite easy to add graphic interest to overheads. Research shows that visible language devices such as maps, diagrams and charts help to filter knowledge and aid the student to manage large amounts of information. (Marcus, 1992:97).

It is also very easy to add colour either for interest or for emphasis. Research indicates that memory for colour information appears to be superior to that for black and white. (Marcus, 1992:87). Some presentation software have templates professionally designed to improve the readability of the overheads.

In technology based subjects, it is also very useful having a computer attached to an overhead projector available for demonstration.

3.1. Advantages

When surveyed students claimed they felt that the electronic presentation was more effective for learning than traditional overheads and that retention rates were higher. (See 5.2). Students also found the use of colour to be advantageous to their learning.

A major advantage to students is the ability to preview lecture material to give them an element of preparedness when they come to the lecture. The ability to have the slides preprinted means that students can annotate them during lectures rather than laboriously take notes without listening to the lecturer.

3.2. Disadvantages

Lighting can be a problem. Most of the projection technologies require the lights to be dimmed which we felt would exacerbate students' natural tendencies to sleep! The results of the student surveys shows however, that students did not experience the difficulties with the darkened rooms that the lecturers feared they would.

ELECTRONIC PRESENTATIONS WILL NOT MAKE AN OTHERWISE DULL PRESENTATION INSTANTLY ATTRACTIVE AND INTERESTING. LECTURING STYLE STILL HAS A GREAT IMPACT ON THE PRESENTATION, AND WITH THE ABILITY TO REVIEW AND PREVIEW THE LECTURE THE STUDENTS MAY BE MORE PARTICULAR AS TO WHETHER OR NOT THEY ATTEND THE LECTURE. WE FOUND THAT THE BEST WAY TO MAINTAIN THE INTEREST OF THE STUDENTS IS TO PROVIDE SLIDES AS THE FOCUS FOR DISCUSSION AND ELABORATION.

4. EXTERNAL COURSES

An informal survey of a small group of external students has found that they feel isolated from the main university campus and find accessing lecturers by phone and mail to be frustrating and slow. Students are more reluctant to ask questions than their internal counterparts and have a greater tendency to withdraw from university studies because of their difficulties and lack of support.

With the advent of the virtual campus and the need for students to have their own computer and modem, it will be a simple matter for them to not only directly access the lecturer and fellow students, but also to access the weekly lectures dropped on to the network for student preview and review. In 1994 we are hoping to be able to conduct formal research into external units and the improvements, if any, this type of programme can bring to the studies of external students. We are currently exploring avenues of funding to be able to provide all external students in Information Systems with modems to enable them to take advantage of existing technologies.

5 AN ASSESSMENT

DURING THE SECOND SEMESTER IN 1993, WE DISCOVERED THAT A FEW LECTURERS IN THE SCHOOL OF MANAGEMENT INFORMATION SYSTEMS WERE REGULARLY PREPARING LECTURES USING MICROSOFT POWERPOINT, AND PRESENTING THEM TO THEIR STUDENTS ELECTRONICALLY. WE DECIDED TO LOOK AT TWO GROUPS OF STUDENTS WHO WERE PRESENT IN THESE LECTURES AND TO ATTEMPT TO ASSESS THE EFFECTIVENESS OF THIS STYLE OF PRESENTATION. AT THIS POINT WE SHOULD EMPHASIZE THAT THE FINDINGS DESCRIBED IN THIS PAPER WERE NOT THE RESULT OF A PLANNED PROGRAM TO PRE-DETERMINE THE EFFECTIVENESS OF ELECTRONIC LECTURES, RATHER THEY WERE THE RESULT OF AN ATTEMPT TO ASSESS THE EFFECTIVENESS OR OTHERWISE OF PRACTICES THAT WERE ALREADY TAKING PLACE. LIKEWISE, IN ORDER TO OBTAIN INITIAL FEEDBACK FROM THE STUDENTS VERY QUICKLY ABOUT THESE NEW PRACTICES, WE DID NOT HAVE THE LUXURY OF BEING ABLE TO PLAN AND IMPLEMENT A RIGOROUS EXPERIMENTAL DESIGN.

5.1 The subjects

Two groups of students were surveyed. Both groups were studying either major or minor options in the school of Management Information Systems. All of the students were in either their second, third or fourth years of study, and all had a high level of computer literacy.

Group A had attended a series of lectures and presentations over a period of one semester that had been prepared in Microsoft PowerPoint, and delivered using a variety of electronic media. Several of the lectures had been presented in full colour (as the use of colour had been important to an understanding of the material content of the lectures), others had been presented in black and white, the visual quality of the presentations had varied according to the media used. The lectures, presentations, and other supplementary course material had been made available on the IBM microcomputer network following each weekly lecture, so that by the end of the semester the students had access to a full set of course material. The students had no access to the material prior to the lectures, and they had no access to the material in printed form unless they chose to print it themselves. Students with access to machines of their own were able to take copies of the material to use at home or at work. In addition, several members of group A had attended a second series of "electronic" lectures, which had been prepared in PowerPoint by another lecturer and delivered using black and white electronic media.

Group B had attended a series of lectures and presentations over a period of one semester that had been prepared in Microsoft PowerPoint, and delivered using black and white electronic media. The lectures, presentations, and other course material were either distributed in printed form during the lectures, or placed on library closed reserve shortly after each lecture. None of these students attended any other course in which material was presented or distributed predominantly using electronic media.

5.2 Procedure and Results

In the final week of semester, Groups A and B were surveyed by a questionnaire, in which they were asked to record their responses on a standard Likert scale from -2 to +2, on which -2 represented "strongly disagree", +2 a "strongly agree" and 0 a neutral response. A copy of the questionnaire is given in Appendix 1. Group A also participated in a group discussion lasting about one hour, in which they were invited to express their views in an informal setting on the presentation of lectures and the distribution of course material. For group B, questions 7, 9 and 16 were not applicable.

There were several differences between the two groups, which were not controlled. The most significant of these being that each group had been taught by a different lecturer, each having their own individual style. We felt it highly likely that these different styles would influence the students' perceptions of the effectiveness of electronic media in the lecture room. However, we found the responses of both groups to be very similar, and found no obvious difference in responses as measured against each of the questions.

We felt that the assessment was primarily a qualitative exercise. However, we have included mean values for Groups A and B in their responses to each of the questions, as these provide a simple numeric guide to the students' responses.

Question 1: *Delivery of slides electronically via PowerPoint is much more effective for learning than traditional overheads.*

With only one exception in Group A, all of the students surveyed in both groups gave either a neutral or positive response to the question (Means: A, 1.13; B, 1.19), showing a very strong preference for electronic presentations. In discussion a couple of students expressed the view that at the beginning of the lecture series they felt that the electronic presentation positively helped their learning, but realised by the end of the semester that the actual presentation method had little bearing on learning effectiveness, but rather had an impact on their level of interest. What did aid learning, however, was the ability to review the slide material after the lecture.

Question 2: *Delivery of slides electronically via PowerPoint is much more effective for learning than high quality overheads - perhaps printed out from PowerPoint.*

(Means: A, 0.69; B, 0.81) See discussion above.

Question 3: *I found the electronic presentation much more interesting than the traditional overhead presentation.*

(Means: A, 1.63; B, 1.44). During discussions it appeared that almost without exception, students felt that the electronic presentation was more interesting. The electronic presentation gave them a positive perception about the units and the lectures.

Question 4: *I found the use of colour to be a good aid to learning*

(Means: A, 0.81; B, 0.25) Group B had one lecture where colour was actually used. Although the students were positive about the use of colour, research shows that colour is superior to black and white in terms of processing time and emotional reactions, but does not improve the ability to interpret information (Marcus, 1992:87).

Question 5: *I found that I was pre-disposed to sleep when the lights were dimmed for the electronic presentation.*

(Means: A, -0.56; B, -0.38) We felt quite concerned that the dimmed lights would put the students to sleep, but their results indicate that this was not the case.

Question 6: *I found that I retained the material more easily because of the electronic presentation*

(Means: A, -0.25; B, 0.25) Neither group commented formally on this question and the results indicate that the two groups had differing perceptions on retention rates. This could be due to a number of factors-teaching styles, better retention due to increased interest in the unit because of the presentation method, or simply a perceived better retention which in fact was erroneous.

Question 7: *I found it very useful to have the presentation stored on the computer network for me to review*

(Means: A, 1.38; B, n/a) Students were regularly observed in the computer labs reviewing the lectures-particularly as exam time approached. At least two students copied the presentations for home use.

Question 8: *I reviewed the lectures almost every week.*

(Means: A, 0.38; B, -0.44) Group B only had access to the slides in hard copy format on closed reserve in the library which could account for their result here.

Question 9: *If I attended the lecture I did not bother to review the slides on the network*

(Means: A, 1.26; B, n/a) The student survey results on this question are an apparent contradiction with question 8.

Question 10: *I would like to preview the lectures before I actually attend*

(Means: A, 0.38; B, 0.25)

Question 11: *Previewing lecture material would be a great aid to understanding what goes on in lectures*

(Means: A, 0.75; B, 0.81)

Question 12: *I would be bored in lectures if I had previewed all the material first*

(Means: A, 0.00; B, -0.38)

Comments on Questions 10, 11 and 12

The results from these three questions indicate that students would appreciate being able to preview lecture material. During class discussion the students aired the view that if they had the opportunity to preview the presentation, they would be able to focus on the lecture and relax about taking notes, or annotate the notes taken from the presentation prior to the lecture. The previewed material would also give the students the opportunity to think about what was going to be presented in the lecture so that they could frame appropriate questions.

Question 13: *When I missed a lecture I found it very useful to be able to review the material*

(Means: A, 0.94; B, 1.00)

Question 14: *I would prefer to have the material in hardcopy form on closed reserve in the library*

(Means: A, 0.31; B, 1.00)

Question 15: *I found notes pages accompanying the presentation very useful*

(Means: A, 1.00; B, 0.56)

Question 16: *I would prefer to have the notes pages in hard copy*

(Means: A, 1.06; B, n/a) Group B had access to the notes pages in hard copy form

Comments on Questions 13, 14, 15 and 16

The students found it very useful to have access to the presentation after the lecture. Again they did not need to take copious notes during the lecture as they were confident in the knowledge that the

overheads were available either on the network or in the library. The students were very enthusiastic about having notes pages available to them, either on the network or in hard copy form.

Question 17: *I would like to see all my lecturers using the electronic presentation*

(Means: A, 0.81; B, 0.56) During discussion, some students said that although they would like to see all their lecturers using this form of presentation, they conceded that the approach was not suited to all subject matter.

Question 18: *I would like to be able to review the slides from all my courses*

(Means: A, 1.25; B, 1.00)

Question 19: *I do not think that all lecture material is suitable for this form of electronic presentation*

(Means: A, 0.69; B, 0.19) See question 17

Question 20: *If I had to miss a large number of lectures, I feel that I would be able to keep up and pass the unit if I had the electronic presentations available to me.*

(Means: A, -0.38; B, 0.94) The student responses varied due to the unit content and the lecturing styles encountered. Group A tended to have fairly brief overheads with a heading, graphic and a small amount of text. These would need a fair amount of explanation if the student missed the lecture. Group B received overheads which contained material in point form which, although elaborated on in the lectures, could be generally considered as stand alone material.

Question 21: *I do not think there is any point in having lectures when I could get all the materials from the network*

(Means: A, -1.38; B, -1.00) Both groups felt that there was still a need for lectures, so that the overheads could be elaborated on, and so they had the opportunity to ask questions and engage in discussions.

Question 22: *If I had a PC and modem at home, I would rather link up to the lab via the electronic campus than come to set labs*

(Means: A, 0.00; B, -0.19)

Question 23: *I would like to have access to the networks from my home as I feel that I could work and study more effectively*

(Means: A, 0.88; B, 0.69)

Question 24: *I would like to have access to my lecturers via electronic mail from my home*

(Means: A, 1.06; B, 0.94)

Question 25: *If I had access to my lecturers through electronic mail I would be able to ask them a multitude of questions instead of wasting time and trying to work things out for myself*

(Means: A, 0.13; B, 0.75)

Question 26: *I would rather try to solve my own problems, but have access to the lecturer for the really difficult questions*

(Means: A, 1.31; B, 1.13)

Comments on Questions 23, 24, 25 and 26

The majority of students were very enthusiastic about access from home. They liked the idea of being able to access both the networks and their lecturers. The computer labs are heavily utilised, particularly at exam time, and the students felt that access at times which suited them would prevent a great deal of time wastage. Being able to access lecturers via electronic mail would also enhance their learning.

Question 27: *If I had access to the computer labs from home I would work much harder and learn much more*

(Means: A, 0.38; B, 0.63) See the comments above.

Question 28: *With the ability to take the PowerPoint viewer home, I could copy the presentation to my disk and view it at home*

(Means: A, 1.00; B, 0.94)

Comments on Questions 27 and 28

Students felt that if they could eliminate the frustrations of competing for computers in the labs they would be able to work more effectively, thereby learning more. Many students have to work through the night, particularly during the exam period, because this is the only time they can access the computer labs.

Students' hardware and software: *In questions 29 and 30, we wanted to find out what proportion of our students have access at home to the hardware and software required to view PowerPoint presentations.*

In responding to these questions, some of the students were unsure. Of the 39 students surveyed in groups A and B, only 5 (12.8%) could say that they definitely had the required facilities. A further 12 students were less sure, giving a total of 17 (43.5%) who were either certain, or who believed, that they had the necessary resources.

We believe that the proportion of students who have access to adequate computing resources at home or at work, will increase dramatically over the next one to two years. We will be monitoring this in 1994 by surveying all of the students in the faculty of business at Edith Cowan University- both full and part-time, internal and external. Given current trends we believe the time will soon come when students in specified university faculties will be required to have computers of their own, which meet a stated minimum specification. In the School of Management Information Systems we are currently investigating the feasibility of providing laptop computers to all students.

6. THE FUTURE

It is imperative that in the 1990's we graduate students from all faculties who are computer literate and who feel comfortable using technology. The use of the electronic lecture will encourage students to use computers to review and preview their lectures either from the computer laboratories or from home via their computers and modems. This may then provide them with the confidence and some of the skills to begin using the computer for other work.

7. CONCLUSION

It is important to remember that desktop presentation software will not turn a poorly prepared presentation into a good presentation. High tech rubbish is a distinct possibility in many classrooms.

Most presentation software will, however, guide lecturers into putting less on their slides and producing more readable slides thereby increasing the effectiveness of the visual aid.

The time has now come when the traditional OHP will no longer dominate the classroom, but will be replaced by its electronic counterpart. This view is borne out by the demand for PowerPoint courses currently being run by Edith Cowan University. Lecturers are beginning to see the advantages, not only of creating slides using desktop presentation software, but also linking their slides to their word processing and spreadsheet software, thereby enabling their information to be instantly updatable.

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ADDRESSING THE MORAL POVERTY OF COMPUTING HIGHER EDUCATION

ABSTRACT

In response to the growing evidence that computing education as generally practised tends to propagate a narrow technicist mindset (part of a general moral poverty in the information age), I explore, from critical social theory and social constructivist perspectives, ways of reconstructing the microculture of traditional learning environments in computing higher education. Lecturers, tutors and students are being encouraged to disclose their goals, values, myths, metaphors and worldview orientations (relevant to information systems) as part of an interpretive introduction, the writing of personal learning journals, interactive dialogues, highlights of humour, times of values clarification and goal setting and the telling of stories and alternative myths. Such a process is an attempt to enrich the curriculum and teaching/learning process by "creating moments of moral splendour" in lectures and laboratories.

KEYWORDS

Computing higher education, moral poverty, metaphors, wisdom, moments of moral splendour.

THOUGHTS

Where is the wisdom we have lost in knowledge

Where is the knowledge we have lost in information

(T.S. Elliot, from *Choruses from 'The Rock'*, 1951, p 157)

"The N.I.C.E. [National Institute for Coordinated Experimentation] marks the beginning of a new era - the really scientific era. There are to be forty interlocking committees sitting every day, and they've got a wonderful gadget by which the findings of each committee print themselves off in their own little compartment on the Analytical Notice-Board every half-hour. Then the report slides itself into the right position where it's connected up by little arrows with all the relevant parts of the other reports. It's a marvellous gadget. The different kinds of business come out in different coloured lights. They call it a Pragmatometer."

"And there," said Busby, "you see again what the Institute is already doing for the country. Pragmatometry is going to be a big thing. Hundreds of people are going in for it."

(C.S. Lewis (1958, originally 1945), *That Hideous Strength*, p.23)

INTRODUCTION

C.S. Lewis in his 1945 science fiction account of the downfall of an English university, foretells the rise of progometry (viz. computing) while T.S. Elliot muses on perceptions of loss of wisdom and knowledge. It is interesting to speculate that the rise of computer mediated information may coincide with a decline of knowledge and a downfall of wisdom. Lewis, a professor of medieval and renaissance literature, in a companion work "The Abolition of Man" asserts that the cardinal problem for traditional wisdom was to "conform the soul to reality" through knowledge, self-

discipline, and virtue. For applied science however, the problem became how to subdue reality to the wishes of men through 'technique'. He goes on to wonder whether "analytic understanding must always be a basilisk which kills what it sees and only sees by killing." (1978, p.47). I would hazard to state that, in computing education, the basilisk, the serpent reptile, are those that would reduce educational wisdom to digitised data and effectively reduce the notion of computing systems to merely the hardware and software and 'technique'.

Put another way, lurking behind the user-friendly interface of current computing education may be a hegemonic spirit of indoctrination into 'technique' rather than education to wisdom through knowledge, self-discipline, and virtue. Computing education as generally practised may indoctrinate students into a narrow technicist mindset, an instrumental rationality that would view the natural and social world as consisting of objects to be dominated and controlled through technology for the desires and interests of autonomous human concerns. To coin a phrase from Bowers (1992), it can be argued that this situation is morally poor, perhaps even morally poverty stricken.

A CRITICAL SOCIAL THEORY PERSPECTIVE

Led by social philosophers such as Horkheimer, Marcuse, Heidegger and Adorno, critical theory has contended since the 1930's that the values associated with technicism and instrumental rationality have increasingly and destructively dominated business, industry, government and education in modernity (Agger, 1991; Held, 1980). Referring to the current environmental predicament, Dryzek (1990), from an ecological perspective, states that, for persons under the grip of instrumental rationality the human mind and its desires are absolute and all important - the natural world and other people are viewed as mere objects for manipulation, to be dominated. With this fundamental intention to dominate, he contends that there develops an overly goal-oriented approach, a tunnel vision which is blinding to alternative approaches, an individualistic, competitive manner of forcing results at whatever cost to the surrounding natural and cultural and social ecology. Instrumental rationality abstracts persons from the world and from others, blocks them from truly experiencing life to the extent to which it is adopted. In business for example, the best way of returning a profile is thus viewed as individuals "making a killing" rather than the communal and ecological perspective of sustainable viability in the long term with profit sharing and worker participation.

The leading thinker in contemporary critical theory, Jurgen Habermas (1929-) provides a fruitful theoretical position. A unity of perspective has characterised all Habermas's work, basically how to understand modernity, in particular the capitalist modernisation of society, but also a distinction between 'work' and 'interaction' and a close and a reciprocal collaboration between philosophy and the social sciences. Habermas refers to his recent work as fallible and open to change - a platform for research rather than a static philosophy of reality (White, 1988, p 14). Since around the 1970's some of the distinctive core themes have been communicative action or communicative rationality (White, 1988, p.1), and social evolution in terms of social systems as distinct from the lifeworld (that is, viewed from the "outside" and from the "inside") (Dews, 1986, p.14).

I am interested in Habermas's recent work dealing with the "lifeworld", (*Lebenswelt*) "an implicit knowledge that can not be represented in an infinite number of propositions; it is a *holistically structured* knowledge, the basic elements of which intrinsically define one another; and it is a knowledge that *does not stand at our disposition*, inasmuch as we can not make it conscious and place it in doubt as we please." (Habermas, 1984, p.34). Furthermore:

Subjects acting communicatively always come to an understanding in the horizon of a lifeworld. Their lifeworld is formed from more or less diffuse, always problematic, background convictions.

This lifeworld background serves as a source of situation definitions that are presupposed by participants as unproblematic. (p.70)

I take this lifeworld to be pre-theoretical understandings underlying the more consciously understood and formulated worldviews (*weltanschauungen*) which can be explored through discourse. While values, presuppositions, assumptions and beliefs associated with the dominant technicist ideology can be consciously disclosed and compared with those from other worldviews, elements of lifeworlds can only be understood perspectively - such as through an analysis of metaphors and myths.

Moreover, Habermas is concerned by what he terms the "colonisation" of lifeworlds - "Like colonial masters coming into a tribal society" - when technocratic rationality forces itself into lifeworld understandings via 'steering' media such as bureaucracy or institutional funding. In computing education I am interested to see if the dominant ideology of technicism can be challenged in classroom discourse and thus somewhat blocked in its colonisation of the lifeworlds of teaching/learning groups in of computer education.

While discourse is taken to refer to any human communication oriented to achieving exchange of ideas, negotiation, consensus, understanding or problem solving, values discourse will be used to refer to that discourse which addresses lifeworld and worldview disclosures related to the discipline. Lecturers, tutors and students can be encouraged to disclose their goals, values, myths, metaphors and worldview orientations relevant to computing technology. Such discourse can be initially encouraged by detailed personal introductions and simple name remembering games at the first meeting. Similar activities can be used to allow the teacher and students to progressively disclose their personal values, goals and worldview beliefs with relevance to the discipline being studied.

As exemplified by *A Theory of Communicative Action* (1984, 1987), Habermas argues that communicative action can balance instrumental rationality or technicism (White, 1988). I am exploring this concept in whether, in the worldview and lifeworld context, educational values discourse in the teaching/learning environment can explore and question the dominant technicism. Can this be done by exposing the values, myths and metaphors of technology associated with technicism and contrast values, myths and metaphors that spring from other worldviews?

CONSTRUCTIVIST TEACHING AND LEARNING APPROACHES

The context to be explored is that of computing higher education in which recent works (Bowers, 1988; Young, 1989) have shown a more mature understanding of Habermas's communicative theory compared with earlier interpretations such as Grundy (1987). There has been insightful work to relate technicism back to personally held individual worldviews and belief systems which can be disputed in educational discourse (Sires, 1976, 1988). Somewhat similar understandings are incorporated in a recent development in educational theory known as 'radical constructivism' or 'social constructionism' (Tobin, 1991; Taylor and Fraser, 1991; Taylor, 1990) and in feminist pedagogy (Davis, Steiger and Tennenhouse, 1989). Tobin's understandings of negotiation in the learning process sound akin to Habermas's communicative action:

The heart of the curriculum is negotiation of meaning. ...The process involves discussion and attentive listening, making sense of the points of views of others, and comparing personal meanings to those embedded within the theories of peers. ...Justifying one position over another and selecting those theories that are viable can lead to consensuses that are understood by those within a peer group." (1991, p.32)

Viewing computing laboratories as scenes for a teaching/learning culture complete with images, metaphors and myths is fertile research ground. In the following quote from Tobin (1991), 'tutor' or 'lecturer' could be read for 'teacher' and 'computer lab' or 'lecture theatre' for 'classroom':

Myths are usually negotiated with the culture and are accepted by those who belong to the culture...The teacher as controller of students is a myth that pervades classrooms. Although it does not seem appropriate for students to be emancipated in every sense, there is a strong rationale for teachers to emphasise emancipatory interests with respect to learning. From a constructivist perspective students must have control over their own learning. Referring thoughts and actions to the myth of teacher as controller of students has led to the highly controlled learning environments that characterise traditional classrooms. Changing the myth might lead to interesting changes in classroom environments. (p.33)

It is interesting to think that perhaps tutors could see themselves as 'social directors' for learning rather than as 'individual student helpers' and as 'learning facilitators' rather than 'expert knowledge givers'. The metaphors suggest certain Habermasian understandings of cognitive interests and ideas of communicative action and, indeed, give glimpses into lifeworlds. The metaphors used are important - do they point to technicism or to something else? As Bowers points out:

Metaphors that encode the cultural group's schemas for understanding moral responsibility will not be derived from a mechanistic root metaphor, as is the case with the colonising discourse of the Information Age. Rather, it will draw upon patterns perceived in the life cycle of the biotic community, and these patterns - the cycles of the salmon, the habits of the wolf, the patterns of the seasons - will serve as the analogues that help humans understand their moral responsibilities. Contextual languages, ..., also serve to frame the person's relationship to community in a way profoundly different from the colonising discourse of individual empowerment within a world community of computer networks. (1992, p.21)

Bowers is addressing a fundamental question in computing education - the extent to which computing education divorces students from the reality of their natural and social environments. He contrasts technicism (expressed in what he sees as the moral poverty of computing education) with other worldviews that understand humans as interdependent members of a larger biotic community. He ends the article with a passionate plea that "the real crisis is not the lack of data or computer literacy, but in the lack of a form of moral and spiritual development that takes account of the interconnectedness of life." (1992, p.21)

For example consider a computer simulation of cleaning an oil spill. As with traditional classroom centred instruction students are once again vicariously divorced from experiencing reality. The new development with computer based instruction is that students are lead to believe that they are part of the reality through using the technology. Given the advertising hype promoting computer merchandise and the awe with which teachers and parents alike view the great new hope of our civilisation's faith in progress, students are left with the clear impression that the technology is the reality - that in a similar way, using information technology, scientists and engineers can deal with real ecological disasters. Here there is a vicarious knowing without really knowing or experiencing; of being twice divorced from reality; of living in a kind of virtual reality; of solving chimerical problems while the technology gives the impression of being able to cope with the real problem.

Even with the 'explosion' of multimedia and the widespread use of powerful educational hardware and competent educational software across the curriculum, I would tend to agree with Weizenbaum that:

"The computer is a powerful new metaphor for helping us to understand many aspects of the world, but... it enslaves the mind that has no other metaphors and few other resources to call on." (quoted in Fleit, 1987)

The question then becomes - "how can we, as computing educators, lead students to create and find other powerful metaphors - metaphors not colonised by the mechanistic, but springing from the unconscious, even from the collective unconscious and the group and community lifeworlds; metaphors for information systems inspired by the cycles of the dolphin near the wide beaches, the habits of the dingo in the red heartland, the patterns and seasons of the bush?"

VALUES DISCOURSE

In my experience it is rare for values, myths and worldviews other than technicism to be given a hearing (let alone weighty consideration) in conferences, especially in information systems. Even though every major tenant of technicism has been shown as problematic, most academics still talk and write and give conference papers based on this position. Given the dominance of positivism with its belief that science and technology are value free (note the glaring inconsistency) it is very difficult to credibly state one's values, worldview or belief system in computing conferences.

However, in the lecture theatre, the tutorial, the laboratory, or the classroom there are many opportunities to gently allow disclosure of teacher and student values and beliefs with relevance to the intellectual discipline of information systems. Strategies included an interactive lecturing approach and encouraging tutors and students to engage in rich discourse in tutorials through the use of 'check-in sessions', the writing of learning journals which the tutors had to assess regularly and encouraging some form of disclosure of ideologies to do with information systems. The following quote from a unit outline describes the learning journal format:

The student general learning journals may include some or all of the following headings:

- a. A significant personal learning experience - a powerful learning highlight (what you learnt, and how you learnt it) that was personally relevant to either your life and/or work. This would not usually be a formal or conceptual insight but rather an existential experience to do with your personal journey of discovery in this area. You should also include insights or experiences made during the week either at work or at home. We would be especially interested in any insight you might have regarding the way in which this unit may be part of your overall intellectual and moral development and also in comments on the affective area (feelings or emotions).
- b. Reflective examination of your own performance and contributions in lectures and tutorials, and your participation in the unit. A record of your comments or questions made in lectures or tutorials should be noted as should, perhaps more importantly, any relevant informal discussions or interactions either with the learning group or outside. You could also comment on your perceptions of the personal and communal group dynamics in the tutorials (e.g. who is doing what and why; if and how the learning group is helpful to the learning process, formal and informal leaders, co-operation, etc.)
- c. Every second week you should include newspaper and journal article clippings that have contributed to your learning experience.

In an introduction to the journal you should list your beginning competency level and previous experience (approx. one page) and your expectations for the course (approx. one page). A reflective summary (approx. one page) and an account of your own values and goals with relevance to information technology (approx. one page) should conclude the journal.

The learning journal is a way of clarifying students' values and worldviews. J. Sires (1976) classifies nine major world-views as rationalism (i.e. liberal/technocratic), existentialism, nihilism, rationalist deism, existential deism, mainline Christianity, eastern mysticism, 'new age' and, problematically, an ecologically oriented 'Gaia' world-view. This classification can be helpful for description and

classification in open discourse but it is rather threatening to disclose values or worldviews explicitly, as indicated by the following student learning journal comments from the first pilot study 1992:

One only comment not favourable of the unit, was the subjective content - that is emotions etc. Learning journals are a good way of getting feedback, however, I could not see the point of expressing emotions, feeling this subject is one of science and objective & logic, unless used purely for graphical self indulgence.

In the second pilot study in 1992 it was found less threatening for students to firstly clarify and discuss goals and strategies to use information systems. Then it was easy to discuss the underlying values and worldview foundations. The actual process began with extensive introductions at the first tutorial to allow interaction and communicative action to build a community of trust. The following journal entries demonstrate this process:

I have not been previously exposed to the Learning/General Journal assignment process to be used in this unit. I must confess that the experience of describing one's feelings and emotions, or of providing information about how a university unit may contribute to your overall moral and/or spiritual development, is new and a something of a surprise.

Initially, I felt somewhat odd about the comments on the moral bankruptcy of information technology, however some of your later question sheets helped to put things in perspective. Although I must confess that I had difficulty understanding some of those philosophical questions, I can see now that there are two sides to the issue and that information technology can have both positive and negative effects.

The teaching/learning process has evolved over the last two years to include detailed personal introductions, the writing of personal learning journals, interactive dialogues, highlights of humour, times of values' clarification and goal setting and the telling of stories and alternative myths. Such a process is an attempt to enrich the curriculum and teaching/learning process by creating moments of moral splendour in lectures, classrooms or laboratories.

DISCUSSION

Prior to the pilot research interventions, the tutorials were conducted in the usual manner - on an individualised, one person per computer basis with the students working keystroke by keystroke from a detailed technical work book. The tutors occasionally gave whole-group assistance, but usually provided individual assistance where necessary. There was minimal discussion and group interaction. Students were assessed on a practical test, a wordprocessed academically referenced essay, and an end of semester theory examination (all competitive, stressful and not open to negotiation either in assessment weightings or methods). The highly structured workbook seemed to impose a rigid technicist agenda on the tutorials. The students almost unanimously wanted to cover the maximum amount of the material in the shortest possible time without reflection or discussion. All the elements of technicism seemed to be present: a goal-oriented and task-oriented method to 'cover' the material; a competitive, individualised approach; a lack of team or group work; a lack of discourse - even the lack of superficial discussion or whole group question and answer; a lack of time for reflection on the deeper meaning or purpose or socio-eco-cultural impact of computing; a lack of group identity to the tutorials; an absence of humour, or art or games or other human aspirations or relaxations; and an overly serious and stressful attitude towards the teaching/learning situation. The tutors seemed to find that the work-book simplified their roles in the tutorials and they thought that the tutorials were proceeding successfully. Students were usually apprehensive about more general educational tasks, commenting on early attempts to incorporate

group activities that these were "wasting time" and "being distracted" from the technical aspects of the course.

The process of rigorously interpreting results will take a long time as the research continues. However, early results do tend to suggest that significant inroads can be made in enriching the teaching/learning process in computing higher education by using values discourse. Initial subjective feedback from students is tentatively encouraging. It is time to let the students speak for themselves:

LUCIUS: At the very beginning, I really don't like the writing of journals. I think that it is rather irrelevant to the course to ask us to write practical and general journals. I just want to get some theories and skills about computer and its system. I do not want to waste time on doing the other things. After I have written the journals for some weeks, I finally realise that it is not as bad as what I think before. During the writing, it makes me think over what I have learnt during the lessons. Moreover, the general learning journal can relate to my daily life. So when I watch the news or read the magazines, I will try to find out if there is something related to the topics I have learnt. In doing so, I can expand my view and try to see things in a more systematic way. Being a business course student, this is new approach for me to get information and write them down. I really enjoy the lectures and all the work. Hoping that someday I can have this kind of valuable experience again.

PERSIS: We were all encouraged to introduce ourselves and explain our nature of present computer use as well as state which Major field of study. As my experience with computers to date is minimal and I haven't yet chosen a Major - I had very little to say. However, I appreciated some of the others sharing their wider experience with our group. It highlighted to me how much competition exists between us bankers trying to get ahead as many of my tutorial group are Bank Officers. ... Suddenly, the future is becoming clearer to me and I look forward to the advancement of technology! ... I was going to write about how computers are like a vehicle. I am in between cars and the inconvenience has me thinking that not having a car is like not having a computer. It's a choice whether to join the busloads in a cheap alternative of time consuming and restrictive travel through technology, or pay the extra to have computer freedom. We can join the busloads, but once given a taste of this freedom and excitement it is almost impossible to turn back. ... I couldn't wait to write my thoughts in this weeks journal but was shattered when I read the opening to the Chapter as it likens computer use to driving a car. Betrayed as I may feel, I have decided not to waste my comparison and so have included it anyway. ... A lesson in self discovery! Completing the self management Values Clarification list in association with Worldviews helps to emphasise how computers and technology can have an emphasis on our goal planning and life. I feel increasingly more positive in my attitude toward Information Systems as it becomes more essential to my personal achievement. ... I have seen the common reactions to new technology with family mostly cynical and my boss is more of a frustrated type. He has been working in the same institution for over thirty years and has seen it grow technologically, but still asks us to complete simple data input functions for his use as he has not taken the time to learn the computer system changes. ... I see being computer competent as either being a sheep in a large herd or choosing to be a soaring eagle. We can stay and munch the grass at ground level to barely survive, or we can explore a higher level to become skilled and sharp to grasp our goals. ... The most effective lesson to allow me to visualise the importance of the course and the large impact on my personal goals and values. By allowing us to see the potential impact on computing to help achieve our goals, I for one was more appreciative of information technology. ... The course provided a perfect combination of both theoretical and practical learning. The teaching techniques were able to expose Management Information Systems as the interesting and exciting subject that it is. With the presentation of actual computer components and regular video viewing, the courses certainly did not lack variety and was able to capture the students attention with the brilliance likened to computer technology itself. ... The lectures were a constant test of our ability not to meet the Lecturer's eyes and be asked to share our learning experiences with the group of students. But seriously, the method ensured we were kept up to date with the material and contributed to reducing the anonymously so commonly seen in Lectures.

TYCHICUS: A unique practice I had seen applied to a university course yet was in the application of Technology in various Worldviews. I primarily adopt an Existentialist World-View in my philosophies of life, but had never extended the view to Information Technology before this event. I term this as an "event" because of the large impact it had my views. ... The various Metaphors in Information Technology are either positive or negative thoughts toward Information Technology. Although most people would prefer to state positive aspects of IT, by realising that negatives exist we can direct ourselves away from these. ... This course in Management Information Systems has given me clarity of values and the sight of my goals in the distance. By focussing on my goals and values I may one day be able to achieve them.

SOSIPATER: Mark gave us sheets about value clarification and using information systems to achieve these goals. They were thought provoking and made me realise that in many instances, I wasn't quite sure how important a certain goal is to me. I can see through ignorance about what I'm aiming for, I might not get very far. Hopefully completing these sheets might help me. ... It surprised me that I couldn't choose a metaphor that applied to me. It seemed many could be included in my idea of how information systems fit into my life, but none really summed it all up. ... I had a talk with a girl in the tute. She was having a bit of trouble and I was able to explain how to fix it. We talked about how we found the course quite interesting. ... I watched a movie called 'The Lawnmower Man' this week. It was about virtual reality and how it can effect our future. Although I acknowledge that a lot of what happened due to virtual reality in the film was fictional, it really opened my mind to the future of this simulated world, "as unlimited as imagination itself." It made me wonder, what are the actual capabilities of this concept? Can it increase your brain capacity as it did in the movie? It reminds me of those metaphors and I think that I could redefine my position as someone who has walked into the room of computer capabilities, and I can see a door leading from the room, but I have no idea how long the passageway behind it extends.

EPENETUS: The lecture was somewhat daunting, inspite of my excitement! I felt as though I had been "thrown in at the deep end", everything happened at once. It seemed as though Mark was talking, the video was running and the overhead projector was on all at once. While my mind was trying to absorb the essence of the lecture, my hand was flying illegibly across the page. My fingers are out of practice of writing at the speed I need them to! ... The tutorial was conducted at a more sedate pace. I enjoyed it immensely and at the end of the hour I felt like I'd been attending Churchlands for years. (I tried not to dwell on the fact that I've six years ahead of me). ... "Being a winner in the information revolution" Is this a revolution race? Who are the competitors? Where is the end of the race? What will we win? What else might we lose? ... The lectures were great, I particularly liked the jokes/anecdotes on the overhead projector each week and the amusing comments thrown in by Mark every now and then - it all makes for an intent listener. The lectures always seemed to be over in five minutes. ... My values have been reinforced this semester rather than dramatically changed. For a while I think I was almost caught in the whirlpool of living like those above but after Mark's lectures, which reminded us to "think", I'm getting back on track. There were some outside influences on my values as well but I feel like I've re-established my goals and values by being reminded to keep life in perspective. Information Technology IS a major part of my life and I enjoy it immensely. All the time we are benefiting from it then that's great, however I think we should be careful of it controlling our existence and taking precedence in our lives.

URBANUS: The lecture I decided to go to was an evening one by Mark Williams, who is my tutor as well. I am looking forward to it actually as I had heard quite a lot of commendable remarks about him. I must say that it was one of the most refreshing and captivating lectures I have attended so far. We didn't really have a break, so we finished a half-hour earlier but I did not feel bored or lost or tired for one minute and that was really amazing for me, especially for a subject that I am not quite familiar with. Mr Williams was a very impressive lecturer and at the end of the lecture, I knew that I would be attending the evening class from here on. He started off the lecture with a cartoon slide on the projector, then added a bit of humour that had us all laughing - a very good start to a late evening class I must say! During the lecture, he covered applications and systems software - the differences, the characteristics and so forth. However, his lecture was rather different as he had lots of "twists" at every stage, so it helped maintain interest and broke any form of monotony. We also watched a video but just as our minds get tired and start wandering a bit, Mr Williams pauses the tape a bit and gives us brief explanation on it. It's as if he could read our minds and could beat us at our own game! Then, just as he feels he has told us enough and our concentration levels were getting a little saturated, he breaks us up into little groups to answer certain discussion questions on the topic. This helps a great deal to sort out any "grey areas" that we may have and it also serves to reinforce all that we had covered in the lecture. It also helps students participate more rather than taking the "backseat" while being "chauffeured" around by the lecturer. At the end of Lecture 3, I walked out with a big grin on my face. I was really pleased and impressed. Mr Williams sure was a man of this information age yet he was a "psychologist" who was charming, witty and with a very good sense of humour - capable of making us laugh, keeping us awake, "enlightening" and educating us all at the same time. .. In today's lecture, we had a guest speaker named Lesley, who was former student of the university and presently working in a computer firm. She introduced us to the world of "Networks" for students and gave us an insight to the programme designed for students interested in majoring in Information Systems. She told us how it helped her as a student and the communications network that she built up in the process which helped her a great deal when she entered the workforce. ... Lesley took up most of the lecture period today but it was quite an interesting session. Mr Williams had his video camera on and filmed Lesley as well as some of us. Most of us were embarrassed thereafter to even look at ourselves on screen. ... At tutorial today, I clarified a few doubts I had over the weekend and Mr Williams as always seemed to have the "magic wand" with him and with one wave of it - everything is sorted out and back to normal again. After that, I worked on my tutorial work as per usual, which was a continuation of the spreadsheet exercises. I was quite enjoying it as I had been putting in the extra hours and was beginning to understand how it all worked. ... At the end of today's lecture, I

stayed back and asked Mr Williams a few questions that I had been pondering about. Basically, I was very interested in the area of how we can be winners in this information age, which Mr Williams had touched upon in our tutorial a couple of hours earlier. It was a very nice discussion that I had with him about morals, goals, type A and type B personalities and the whole information revolution in general. I was really glad that we had a chapter on the future of the information and how we as individuals can emerge as motivated, knowledgeable, successful people in this age.

ZILLAH: Have had a very bad week - lost all interest and purpose as regards my study and really felt I didn't want to proceed any further. Needless to say I didn't touch one book or make my weekly visit to the Computer Centre and that makes me feel worse. Everything seems so difficult. ... In to-day's Lab 8 (Creating and Printing Charts) and made pretty pictures, etc... Mark praised my journals - just what I needed - encouragement. ... Did feel my spirits rising just by talking to Margaret and a couple of other students. I have regained some confidence in myself - I can do it!! ... On reading my Journals, I have to admit that I am certainly not the same person I was 12-13 weeks ago! I detect indications that my initial enthusiasm has waned and even some of my sense of humour perhaps. I am struggling with University life - I have found it difficult to meet the demands of a full-time job and study and do not feel confident that I will successfully complete the semester, i.e. pass the end of term examinations. ... I do not believe that I am cut out to be a full-time computer guru. I appreciate that computer technology is, and will continue to be, an important part of the business world, but I prefer the human element of business, which is why I've chosen the field of Human Resources as my Major. Although there are times when I am "anti-people", I like to think there will NEVER be a day when human beings would rather talk to a computer than to a fellow human being.

LAMECH: Throughout my first semester at Edith Cowan University, I have been amazed at the amount I have learned from other students studying business. I used to think of education as something you got from a text book and lecturer, but I am beginning to realise that you can learn valuable lessons almost anywhere, anytime and from anyone. I am pleased to be studying with a group of students from whom I can learn a great deal from, and I am encouraged to know that an education isn't just confined to classrooms and books. ... When I came up with "A strong swimmer in the information age". This reflection helped reassure me that I can be a winner in the information age if I continue to try to work with technology, rather than be a pessimist who tries to avoid and ignore the value of technology, and the powerful role technology plays in the world today. ... The learning journals were another aspect of the unit which I found most valuable to my learning process. The journals enabled me to reflect on just how much I had learned over the weeks, and gave me time to reflect on my values and goals, which is something I probably wouldn't have done otherwise. Overall, I found the unit quite enjoyable and I learned a lot more than I had expected to at the beginning of the semester.

ABIMAEL: A pleasing aspect of the lecture was the suggestions of how to succeed in business. This is not something previously discussed in other units and whilst many of the suggestions may be obvious, I believe it is important to have ones own thoughts supported and reinforced. ... Looking back over the past 14 weeks, I can honestly say that Management Information Systems 1 unit has opened my eyes to a great deal more information that I originally thought it would. ... Before this unit I viewed information systems through blurry eyes. Being involved in this unit has been like trying on a pair of glasses for the first time and seeing the world how it really is.

There has been significant interest and enthusiasm, as well as some hesitation, demonstrated by lecturers, tutors and students alike. The School of Management Information Systems at Edith Cowan University now uses the learning journals as significant assessment items in its major core unit on all 3 campuses and in other units in post-graduate and office automation studies. It would be fair to say that the research interventions have had significant impact in many teaching/learning situations and have created some considerable ferment as people discuss and examine personal, communal and societal values, worldviews and ideologies in computing education. This in itself is an indicator that a moral poverty is being addressed and teaching/learning is thus being enriched. I would not assert that this in itself is enough to stem what I see as a loss of wisdom in contemporary education - but it is a start. The enrichment process includes the use of such strategies as detailed personal introductions, the writing of personal learning journals, interactive dialogues, highlights of humour, times of values' clarification and goal setting and telling of stories and alternative myths. But soaring over and above these mere strategies is a vision and a hope that some understandings from traditional wisdom can be resurrected, even in computing education, to encourage students, lecturers and tutors alike to begin and continue that long journey of true education - to "conform the soul to reality" through knowledge, self-discipline, and virtue.

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**FIRST YEAR ECONOMICS
A TEST OF VARIATIONS IN THE TEACHING SEQUENCE**

INTRODUCTION

A review and re-appraisal of the methods of teaching in first year microeconomics was prompted by a number of issues that arose at the University of Adelaide during 1992. The challenge taken up by the managers of the course was to try to increase the work effort by students while also raising the degree of interest in economics and retaining more students into subsequent years as well as raising the amount of material retained by students moving into later year subjects. The long run target was therefore greater retention of 'bodies and minds' in economics and this target was to be pursued under binding constraints on the teaching time available.

This paper reports the strategy adopted in terms of the restructuring, not of the content of the course, but in terms of the manner in which it was taught. A comparison with a control group at the neighbouring University of South Australia was organised which permitted an evaluation of the effects of the changes in the teaching methods. The results of that comparison and also of the student evaluation of the restructured course are reported in this paper.

The next section provides more detailed background on the issues that had arisen and the motivation for the changes. The following sections outline the approach used to develop a revised approach to teaching the first year course and the changes that were actually made. The subsequent sections report the evaluation of the changes. The last section of the paper summarises the results.

This paper reports the results of the evaluations of only some of the implications of the changes. Other dimensions of the effects of the course could be evaluated at a later date, for example the rates of retention of bodies and minds. Other aspects of teaching can also be examined in more detail using the data collected during the evaluation conducted so far, for example, the role of different forms of assessment and the impact of computer aided instruction. These topics will be taken up in other papers. In this paper we concentrate on the evaluation of the change in the sequence of teaching.

BACKGROUND

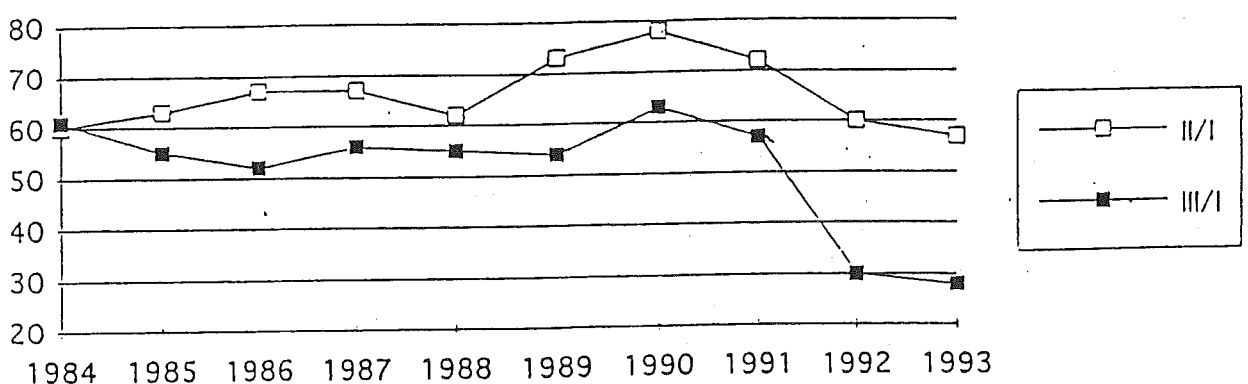
One of the issues which prompted a reappraisal of the teaching methods in first year was the results of a survey of students that was carried out at both Adelaide and the UNSW. The survey produced some disturbing results about students' use of time and their preparation for class. It indicated that students were on average spending 3.6 hours outside class time (of 4 hours) working on the course. Total time spent on first semester economics, assuming attendance at lectures and tutorials was therefore on average less than 8 hours. At the UNSW, the average time outside class time was 2.9 hours. The time spent on the course (less than 'an 8 hour day') was in the view of the University of Adelaide instructors relatively low for a course which accounts for a quarter of the student load.

The second issue was the evaluation in 1992 of the first semester course in first year microeconomics by students at the University of Adelaide. That course was organised in terms of three hours of lecture time and a one hour tutorial. Students were asked at the end of the semester to rate the course in terms of a number of characteristics, by giving the course a score within a defined range. It should be noted when interpreting these scores that the course is taken by some students as a matter of choice (eg by BA students) and by others because it is a requirement for their degree (eg BCom students). Some of the latter group may have not chosen first year economics if given more flexibility and their enthusiasm for the course as well as their evaluation of it may be affected by these constraints.

The average scores reported by students were converted to percentages (also reported in more detail below). Students generally rank courses in this form of assessment in comparison to others they take, so a score of 50 can be interpreted as indicating their average experience or their expectations. The results for microeconomics in the first semester of 1992 included a score of 72 for the amount learnt, 68 for the overall value of the course, 64 for its effects on broadening student horizons, and 60 for student enthusiasm for the course. The tutorials received scores of 77 for relevance, 69 for linkage to lectures and usefulness and 56 for the extent to which students found tutorials 'stimulating'. Staff responsible for the course were concerned about the large gaps between the overall assessment of the course (scores of 64 or more) and the lower scores for enthusiasm for the course and the degree to which the tutorials were stimulating. While this may in part reflect the composition of the student group, it was also hoped it would be possible to raise the level of enthusiasm for studying economics.

The third factor was the continuing interest in the Department in bolstering the retention rate of both 'bodies and minds' in economics into second and subsequent years. Figure 1 shows the retention rates measured as the ratio of second and third year enrolments in the core BEc units as a proportion of the relevant first year class for the decade to 1993. Up to 1991, these retention rates were at least 60 per cent for the second year subjects, and reached a peak of nearly 80 per cent in 1990. They were in the range of 50 to 60 per cent for the third year subjects. The rates then fell sharply in 1992 and fell again in 1993 (see fig. 1). Retention rates of the first year class into third year have fallen to about half their level of the 1980s. However second year rates, while they have fallen 20 points since 1990, are about the same as they were in 1984.

Figure 1: Retention rates in core BEc units in years II and III of the year I cohort, University of Adelaide, 1984-1993.



A cause of the fall of retention rates in 1992 was the availability from 1990 of a BCom degree which had fewer requirements from among the core economics units. That is, first year students enrolling in 1990 could nominate for the BEc or the BCom. Students accepted into the BCom had the same first year requirements as BEc students but thereafter the requirement to complete core economics units diminished.

The effect of the BCom is more evident when the data on retention rates by course are examined. The retention rates into third year of the non-BCom students was 61 percent in 1992 and 50 percent in 1993. These numbers are within the range of the experience of the previous decade of retention rates into third year prior to the introduction of the BCom but it remains to be seen if the fall in 1993 compared to 1992 is the start of a trend.

The scope for retaining the enrolments of BCom students is limited when those students wish to specialise in accounting. Their interests are in obtaining as many of their professional qualifications in the shortest time possible. However, it is also possible to establish the relevance of economics for the subsequent careers of those students and the relevance of various aspects of economic theory for their accounting courses. Other BCom students specialising in finance, marketing or organisation theory have the scope to continue to enrol in economics courses. Thus retention rates for BCom students are not exogenous.

The same point also applies to students enrolled in other courses. Even BEc students may switch to other degree courses. Students enrolled in other degrees (eg BA or BSc) might be attracted to economics after their first year experience.

All these students can substitute economics units for others. Their choice will depend on their expectations of the costs and benefits of doing so. Those expectations will depend in part on their experience of aspects of the teaching of economics units, especially in first year.

As students proceed into subsequent years, both instructors and students gain from a high rate of retention of the material learnt in previous courses. While there was no specific concern about the retention of material one criterion for any change in teaching methods is that it should not reduce the retention rate of material studied in the course. There would be a benefit from the changes if the retention rate of this material actually increased.

First year instructors had already agreed to a relocation of some relatively more technical material (eg indifference curves and isoquants) out of first into second year. Given that shift, a further criterion was that any restructuring of the course should not reduce the range of topics covered.

There was an interest in the Department in responding to all these developments while meeting a binding budget constraint. In other words, the total number of staff teaching hours (include contact hours by part-time tutors) should not change. The Department was however prepared to support the training of and the development of skills among the tutorial staff.

In summary, there were concerns that i) the students were not working at a rate that might be expected of them, ii) they found the course and the tutorials insufficiently stimulating and iii) retention rates were falling but that (iv) any changes should not reduce, but actually increase the retention rate of material studied, at the same time as (v) not reducing the course coverage and (vi) meeting the budget constraint.

There were a couple of other changes that made consideration of a substantial reform package possible.

One was the availability of a new package of teaching materials associated with the publication of a new first year text by McTaggart, Findlay and Parking (1992). These included a study guide (Bentick and Spencer, 1992) and a computer aided learning package (Addison Wesley, 1993). In addition, a collection of newspaper clippings some worked with answers and others with questions was published in early 1993 (Cowie, Findlay and McTaggart, 1993). This package of material created new opportunities for changing the teaching mix.

Another was the process initiated in 1992 and supported by the Department of the development of the teaching skills of the tutorial staff. This effort took the form of a series of workshops on teaching issues, regular weekly meetings with staff and monitoring of their performance. Staff in charge of first year were more confident as a result of the ability of the tutorial staff to manage the changes that might be made to the course.

In this paper we review the changes made to the course in response to these developments. We comment in more detail on the rationale for those changes and present a preliminary assessment of the results.

Briefly, the object of the reform was to design a new teaching methodology that reflects the dictum 'that the best way to learn economics is to do economics'. The aim was to design a new package based on the "deep approach" to learning, as opposed to the surface approach. Such a methodology would transfer to students responsibility for learning the "vocabulary and grammar" of economics so that instructor time could be devoted to the higher productivity application of showing how those skills can be used in communication and problem solving. Demonstrating the relevance of economics to current issues and business decision making was also relevant to the objective of raising retention rates in economics courses.

PROBLEM-BASED LEARNING

'Thinking like an economist' involves problem solving so it is important to ensure that problem-based learning is well integrated into any new teaching package. Problem-based learning has been described as follows (with adaptation from medicine in the original source to economics):

"the acquisition of knowledge of economic processes which is more easily remembered and retrievable in a professional setting, by the encouragement of learning around economic problems right from the start of the course;

the acquisition of analytic skills to enable this knowledge of basic processes to be used in the evaluation and solution of problems;

the development of a pattern of learning by students, independent of teaching, which will continue during their professional life". [Thompson and Williams, 1985]

Newble and Cannon (1991) distinguish two broad approaches to learning (as summarised in Table 1), one of which will and the other of which will not produce the above desirable results from students. The first is called the surface approach. In an economics course this would imply being able to define various economic terms and concepts, but not being able to analyse issues not previously studied. Because the surface approach to learning is only on a superficial level of understanding, students have a tendency to 'dump' information acquired shortly after assessment.

The objective of 'teaching students to become decision-makers' requires an economics course that will encourage students to adopt the deep approach to learning.

TABLE 1: TWO BROAD APPROACHES TO LEARNING

1. *Surface Approach*

- students are motivated by fear of failure
- they fulfil the assessment requirements by memorising factual material
- they do this by rote learning
- the outcome is factual knowledge but only a superficial understanding

2. *Deep Approach*

- students are motivated by an interest in the subject and/or by its vocational relevance
 - they aim to understand material
 - learning processes do not rule out rote learning but the motivation and outcome differ from those in the surface approach
-

Siegfried and Round (1994) in their survey of Australian economics students uncovered a sentiment amongst students that were not acquiring the skills they expected. In response to questions about their motives for studying economics, students (especially students not in an honours program) rated most highly "developing the ability to think clearly" and "develop problem solving skills". The next three items were "master the knowledge of a discipline", "increase the capacity for self learning" and "prepare for employment".

Siegfried and Round found that students rated the lectures they received and the rigour of their curriculum as the strength of the Australian undergraduate degree in economics. The aspects of their experience which disappointed them most were their training in writing essays, the course advising they received and their instruction in problem solving. Siegfried and Round found there was no relationship between the quantity of writing required and the perception of the quality of training in writing. They conclude that "perhaps more is required than simply assigning an essay and returning a marked paper to the student".

Siegfried and Round report that Australian economics students believe that the development of their ability to think clearly and to solve problems is the most important goal of undergraduate education. Yet, in a disturbing conclusion, Siegfried and Round report that students rate their courses poorly on this dimension. They conclude that "if problem solving is to gain a more central role in economics degree programs it needs to be taught consciously, reinforced through practice, and included in assessment". That quotation also summarises the objectives of changes to the first course that were tested at Adelaide and the University of SA in 1993.

Newble and Cannon make a number of specific suggestions about how the learning environment could be changed to a problem solving approach. They are concerned that some disciplines are too much oriented to didactic teaching in lectures and to the use of multiple choice questions as a method of instruction. The latter certainly makes grading easier and these characteristics are common in the teaching of economics.¹

The experience of Newble and Cannon is that institutions which encourage the preferred approach to deep learning make more use of small group techniques and assessments based on tests of the ability to solve problems. They suggest changes such as -

- making explicit the course objective of developing the capacity of critical thinking and problem solving;
- increasing the time devoted to small group learning;
- decreasing the amount of factual material to be memorised;
- spending time with students as they apply the basic principles and asking questions like 'why?'; and
- reviewing the assessment procedures. [see also Thompson and Williams, 1985]

The dilemma is clear. The attainment of a deeper approach to learning can come at the cost of extra instructor time through time spent with students, on course design and administration, and in assessment. Usually, given the common rules for the determination of teaching loads, extra time in teaching first year will spill over into higher loads for all members of Department, at the cost of their research time, leisure time or at the cost of preparation for other courses, for example. The development of a new methodology of teaching economics can help in the resolution of this dilemma. The new comprehensive teaching packages now available (and at Adelaide the development of the teaching skills among the tutorial staff) can make up a new technology of teaching which gives instructors a greater set of opportunities without diminishing the skills in the techniques of economics that students acquire.²

DESIGN FOR TEACHING

Before exploring how teaching design can be modified to enhance deep learning by students, it is necessary to analyse the process of learning economics. This process can be divided into two steps:

- 1) learning the 'vocabulary and grammar' of the discipline, that is, the terms, concepts and standard models
- 2) using the language in communication and problem solving.

In standard instruction techniques in economics a large amount of instructor time is taken up in teaching 'vocabulary and grammar'. This is the case in lectures as well as in small group sessions (or 'tutorials'), where lecturers, with extensive expertise in their field, in many cases provide students with summaries of material presented in their textbook, and tutors resort to supplying answers to questions on material covered in lectures.

The ideal is to design a curriculum which transfers to students the responsibility of step (1) thereby freeing instructor time which can be devoted to its higher productivity application, that is, step (2). Objectives in designing a package where instructors spend less of their time on step (1) and more on step (2) are the following:

1. To develop techniques and strategies to ensure quality teaching which means, in economics, that students i) become familiar with the language and concepts of economics, ii) have experience in the application of these concepts in commenting on current issues, iii) gain

further experience by giving presentations in a variety of forms (projects, reports, seminars, workshops) on the results of their work, and iv) acquire the ability and skills to apply frameworks from economics to solving economic and other problems.

2. To develop a set of techniques and combination of teaching methods which can be extended into subsequent years in economics as well as other social sciences.
3. To develop a set of techniques for assessing alternative combinations of teaching methods (e.g. various combinations of lectures and tutorials, various mix of activities in tutorials and workshops, use of alternative media).

TEACHING STRATEGIES

The broad features of the new teaching strategies were the following:

1. New design formats for lectures and tutorials, details of which are presented below, were used to engage the students more actively in the learning process.
2. Interactive software was integrated into the teaching program. This allowed the redesigning of tutorial/workshops to contain more hands-on application of theory. Students had access to the managed-learning packages through the facilities in the on-campus statistics laboratories, the campus library, or PCs used at home.
3. Workshops were available to provide an opportunity for students to work on problems with other students or seek advice from a tutor.
4. New designs were tested for assessment based on the deep learning approach and problem-solving. Multiple choice questions were only used during the semester in short tests (10 to 15 minutes) completed in the tutorial times. The exam consisted of a section of T/F questions (one third weight and no choice) where students also had to explain their answer: the balance was a set of five newscippings from which the students could choose three on which they had to answer a series of questions.
5. Along with regular meetings of tutors, professional development seminars and workshops on teaching techniques were set up for tutors and lecturers.

The following extract from the course outline prepared for students summarises the strategy adopted for teaching:

Extract from the Course Guide

In this course there will be a particular sequence of events which will make up the process of learning. Sometimes you will be meeting with other students, for example, in

- o tutorials
- o class meetings
- o workshops.

At other times, you will working on your own. Here is the sequence of events -

1. You read the prescribed material in the text book.
2. You use your Study Guide to test your understanding of the concepts presented in that section of the book.

3. After you have worked through the Study Guide you go to the Computer Laboratory, work through the tutorial material on a computer there and answer some multiple choice questions contained in the same package.
4. Then you answer a problem which we have given you which relies on a knowledge of that material: you write out your answer and hand it to your tutor.
5. The next step is to get ready to go a tutorial, that's a meeting of about 15 people with your tutor. First, you do the reading for the tutorial and think about the item which we have also asked you to prepare for discussion: these items are included in the list below.
6. At the tutorial your answer will be handed back (without many verbal comments but extensive written comments and a mark will be given you). In the tutorial you will debate some current issues, work together to solve the discussion problem, depending on the material that has been set. Tutorials last for about 50 minutes.
7. You go a class meeting where we will show you other examples of how economists communicate, and how they use the concepts they have developed to solve problems. We've given you the topics of these sessions in this Guide and references to material that you should read before you come to class. There'll be three hours of class meetings a week. In these meetings we will also review the progress of the course, remind you of the preparation which you should have completed by the time of the meeting and also review some concepts that people are having trouble understanding. We will also review the tutorial questions for the previous week and discuss those which caused difficulties.
8. If you are having difficulties with a particular concept or if there is a problem that you can't solve then you can come to a workshop where one of us will help you work to a solution.

What happened to lectures?

That's right, there are no lectures in this sequence.

We meet in tutorials, workshops and class meetings. We don't have lectures where we laboriously work through material in the text. Why should we work through the text? The concepts and ideas are explained there. There's no point in repeating this in class. In that time, we want to show you how to use the concepts to solve problems or discuss issues which are relevant to you.

In the class meetings, you will want to record details of the extra examples of the application of the analytical methods you have learned, note some extra points about particular concepts with which you have had some trouble and which have been explained in the meeting, check your preparation against the timetable reviewed in the class meeting and so on. You can supplement these notes from the text book, your Study Guide, the tutorial answers with your tutor's comments, and other notes you have taken in workshops or classes.

What is your responsibility?

This sequence of teaching puts the responsibility on you to get going on each topic in the course.

Your responsibility is to complete this preparation. If you don't then you'll have trouble with the tutorial exercises, you won't be able to contribute to the discussion in the tutorial and you'll get far less out of the class meetings. The class meetings should not be your first experience of any particular set of concepts or their application. The class meetings are designed to be reinforcement of those ideas.

How will your performance be assessed?

Here's the form of assessment:

Tutorial answers	13
Tutorial participation	5
Tests (4x3)	12
Project	25
Exam	45
TOTAL	100

First, we want to reward you for good efforts in your tutorials. We will be marking each tutorial answer. Those marks will be recorded and will count 13 points towards your final grade. You will also be given a mark out of 5 for participation in tutorials.

We also want to check on your progress on learning. To do that we will be giving you a 10 minute test about every 3 weeks at the start of the tutorial. This test will be a set of multiple choice questions. The style will be similar to that in the Study Guide. Your scores in these tests will be recorded and they will count for 12 points towards your final assessment. The dates of the tests will be chosen randomly. There may or may not be a test in any particular week. You will find out when you come to your tutorial.

We will give you a project to write. This tests your ability to communicate using the language of economics about a current issue.

Finally, we will give you an exam. The project and the exam reflect our targets in the course. The assessment of your performance there carries the most weight (70 points out of 100). The other 30 points is an encouragement to keep up your momentum! The other forms of assessment also help us keep in touch with your progress.

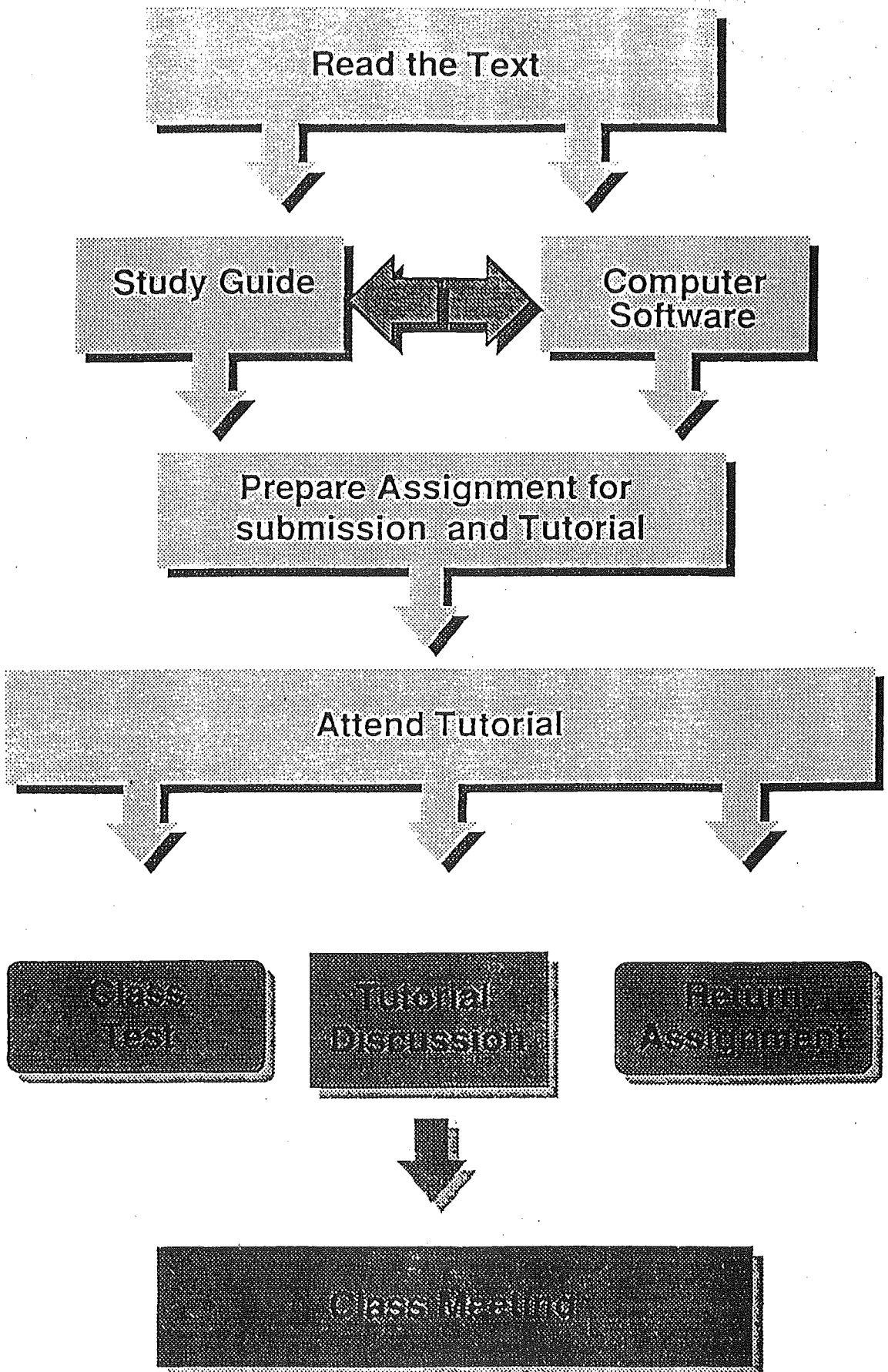
The difference between the method proposed and the previous method is summarised in Table 2 and the teaching strategy is summarised by the flow chart in Figure 2. Option A follows the traditional formal lecture/tutorial format, as outlined by Gibbs (1992), which is effective in rote learning, such as basic knowledge acquisition and comprehension and unlikely to be as effective in developing skills, such as application, analysis, synthesis, evaluation. Option B, is designed to be more effective in both.

Table 2: Options for Teaching

		<i>Option A</i>	<i>Option B</i>
A	Course Outline	Standard	Expanded
B	Text	Reading (2) *	Reading (1) *
C	Study Guide	Self Study Test (2) # *	Self Study Test (2) *
D	Software		CAL (3) * @ (animated concept testing)
E	Large Group	Lecture (1) * (Concepts)	Class Meeting (5) @ (problem solving)
F	Small Group	Tutorial (3) * (answers given)	Small Group (4) * (group work / presentation)
G	'Reading Between the Lines'	Tutorial discussion (3a) #	Tutorial Discussion / presentation (4a)
H	Log Book		Personal Diary of Work (4b) @ (kept by sample set of students)
I	Workshops/Seminars	Optional (4) * #	Optional but Timetabled (6) *
J	Professional Development	Optional #	Expanded for tutors @
K	Teaching Guide	Weekly Tutor Guide #	Expanded semester - Tutor Guide

In Option B in Table 2 some effect on student performance could be expected because students are given incentives to work harder. However the change in the course of switching from option A to option B was intended to involve more than simply a "deep end" effect. The stress on the application of material learnt, on problem solving and on presentation, all of which were backed up by the design of the assessment was intended to encourage a deep approach to learning. The sequence in which the ideas, concepts and models were discovered and understood, initially by students working alone, rather than in a classroom, might also affect the extent to which those things are retained and then can be applied.

FIGURE 2



ASSESSMENT OF CHANGES TO THE TEACHING PROCEDURE

The course changes should be assessed from several perspectives. One is student performance. Anticipated outcomes include a decrease in the fail rate, a redistribution of grades towards credits and distinctions, a lower attrition rate of students between first and second year, and a greater retention of first year material into following years.

Another is the assessment by the students of the course, particularly in terms of the value of the course, the extent to which it broadened their horizons, the extent to which it contributed to their goals from enrolment and the skills that they acquired, not only in economics but also in terms of study skills.

In this section we report the procedure we adopted to assess the course and in the following sections report results from these perspectives.

The assessment of the changes to the course involved collaboration between the Departments of Economics at the University of SA and the University of Adelaide. Although the Departments of Economics from the Universities of Adelaide and South Australia are significantly different in their backgrounds, facilities and student body, they have traditionally run similar courses (text, supplementary teaching materials, course outline and content, assessment, etc) in first year for a similar mix of students (age, sex, education, nationality, etc). At the University of Adelaide the students are mostly economics or commerce majors, have an average first year class size of 450 and are taught on one campus. However, at the University of South Australia students are spread over four campuses and externally, and have lower entrance scores (by about 15 percent) than Adelaide students.

University of South Australia students followed Option A and University of Adelaide students followed Option B in Table 2.

The first assessment of the change reported below is the differences in exam marks between the two Universities. Students at the two Universities sat the same exam on the same day at the end of the first semester. The exam consisted of a 10 true/false questions in which students had not only to indicate whether a statement was true or false but also explain their answer. This section counted for 33 percent of the total exam mark. Students then were asked to write guided short answers on three topics which they could choose from 5. Of the five options made available, four were identical in both exam. This was the only difference in the exam which arose because the University of South Australia course covered three fewer topics than the Adelaide course (oligopoly, regulation, and public choice). A common marking guide was prepared and used at both Universities, although the staff involved in marking differed between the institutions. Some of the issues that arise in a comparison of the grades in the exam across campuses are discussed in the next section.

In addition to an exam, students were also asked to complete other forms of assessment. However these differed between the two Universities and student performance in these other forms of assessment was not compared as part of the test of the contribution of the difference in teaching methods.

In addition a group of volunteers from both campuses completed a weekly questionnaire on their use of time, of the teaching materials and on their views of the course that week. The tutors completed a complementary assessment each week.

By the end of the semester we were able to evaluate each option from the perspective of the students through their weekly evaluation sheets, the tutors and lecturers through similar weekly evaluation sheets, the entire class of students through a comprehensive end of semester assessment / evaluation survey, and through pass / fail rates between alternatives and the distribution of grades, the average time spent per week outside of formal contact hours by students, the areas of difficulties.

Over the next year, we will also be looking for changes in the drop-out rate from economics into second year, the retention rate of information learned and whether the second year teachers find it necessary to teach again some of the basic technical material that is expected to be learnt and understood in the first year course.

EXAM SCORES

The Distribution of marks in the exam at the end of the first semester at Adelaide in 1993 showed a shift away from the fail end of the scale. The proportion of students earning a mark of credit or greater rose from 34 percent to 42 percent. The failure on the first round exams score fell from 12 percent to 8 percent (see figure 3).³

This was a significant result given that the entry cut-off score had been reduced and, and while the average score of students in the course was approximately the same (395 in 1992 to 397 in 1993), the proportion of students entering the course with a score less than 390 (or 78 percent) rose from 25 percent to 39 percent (see figure 4).

Figure 3

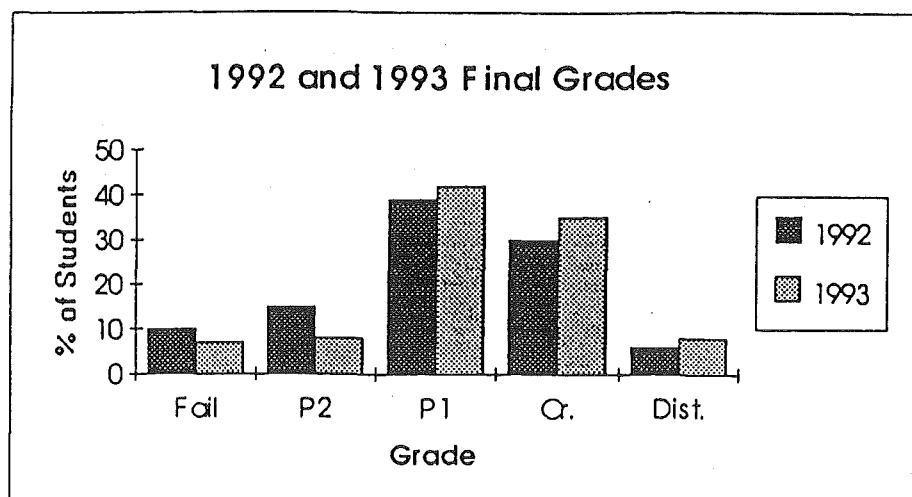


Figure 4

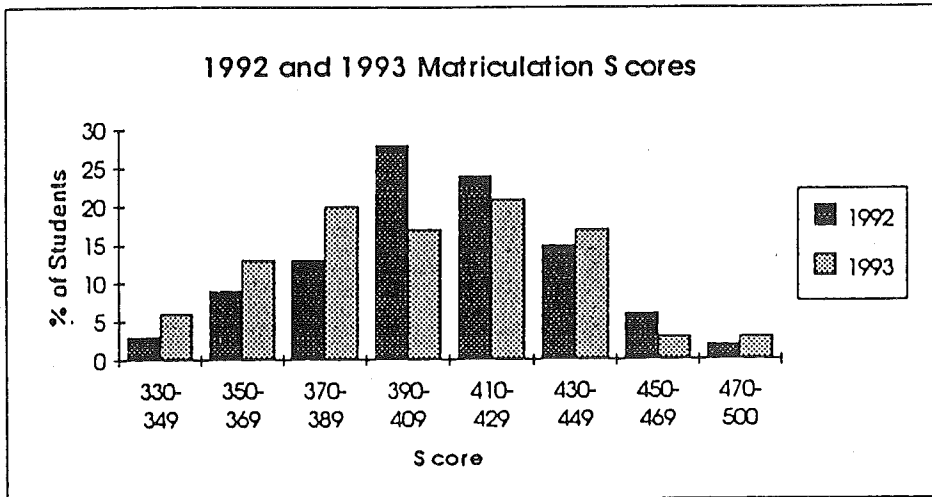
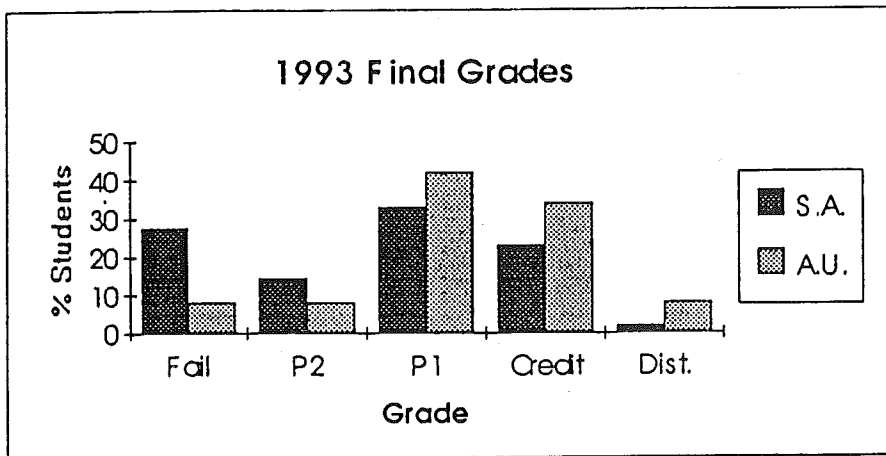


Figure 5 shows a comparisons of the exam scores of students at Adelaide and the University of South Australia.⁴ The failure rate at the University of South Australia in these exam scores at the time of the exam was 28 percent (compared to 8 percent at Adelaide). The proportion of students earning a grade or credit or higher at the University of South Australia was 25 percent (compared to 42 percent at Adelaide).

Figure 5



However this simple comparison of exam scores is not a powerful test of the effect of the change in the teaching methods since the characteristics of the group of students had changed and also the content of the exam was different. A more powerful test involves a comparison of results between the two Universities.

Teaching methods differed between the two Univeristies and the aim of the work reported in this section was to estimate the effect of that change on exam scores. However students differ in other respects, not just institution of enrolment, so an attempt had to be made to control for other characteristics. In principle, one of the most important of these characteristics will be performance

in high school, reflected in the year 12 entry score. Other important characteristics are sex, age, full time or part time study, whether students are repeating the course or not and the school they attended.

As a first step, we regressed the raw unadjusted exam scores from each University on a bundle of characteristics. The results for the University of Adelaide students and for University of SA students are reported in equations [1] and [2]. The dependent variable is the exam score in percentage terms. The average exam scores in the sample were 55 percent at Adelaide and 56 percent at the University of South Australia. Average entry scores were 397 out of 500 at Adelaide and 339 at the University of South Australia.⁵ Average ages were 19 at Adelaide and 22 at the University of South Australia.

$$\begin{aligned} \text{Exam(ADL)} = & -5.88 + 0.11*\text{SCORE} + 0.62*\text{AGE} + 1.85*\text{BEc} + 5.51*\text{BCom} \\ & (0.57) \quad (5.36) \quad (2.68) \quad (1.28) \quad (3.21) \\ & + 4.68*\text{REP} + 0.79*\text{F/T} - 3.19*\text{FEM} \\ & \quad (3.61) \quad (0.30) \quad (2.78) \end{aligned} \quad [1]$$

$n = 338, \text{Adj. } R^2 = 0.28$

$$\begin{aligned} \text{Exam(USA)} = & 30.54 + 0.06*\text{SCORE} + 0.51*\text{AGE} + 5.84*\text{CAMPUS} \\ & (2.66) \quad (2.79) \quad (2.13) \quad (2.76) \\ & - 1.65*\text{F/T} - 0.78*\text{FEM} - 8.80*\text{M} \\ & \quad (0.63) \quad (0.53) \quad (1.41) \end{aligned} \quad [2]$$

$n = 243, \text{Adj. } R^2 = 0.09$

In both institutions, entry score (SCORE) and age (AGE) are positively and significantly related to exam score. Other things equal there was no difference between scores of full time and part time students (F/T). Female students (FEM) achieved significantly lower scores at Adelaide in 1993 but sex was not a significant explanator of variations in score at the University of South Australia. Students at Adelaide who were repeating (REP) or who were enrolled in the BCom did better than either first time students or other degree students. At the University of South Australia, students at the city campus (CAMPUS) did better than others. Students entering under the mature age entry scheme at the University of South Australia (M) did no better or worse in the exam than others, other things equal. The type of high school attended (eg state or private) was tested for a sub-sample of Adelaide students for whom data on that variable were available and found to be insignificant.

The Adelaide equation explains a much higher proportion of the variation in the scores than the University of South Australia equation. Clearly there are a number of omitted variables which contribute to variation in scores within each institution. In terms of a production function analysis, we have estimated output (exam scores) as a function of fixed inputs such as accumulated student skills and other characteristics. We have not been able in the aggregate sample to include the effects of variable inputs such as student effort or the way in which students used the teaching materials available. However we have collected data from a sample set of students across both universities for further investigation.

The effect of teaching methods was tested by estimating a single equation to explain variation in scores at both institutions and including variables for which information was available for both institutions. The result is reported in equation [3]. While the dummy variable is interpreted in this equation and others as a reflection of the difference in teaching methods, it will also reflect some other factors. For example, the courses were taught by different people at the two institutions and

the dummy variable will mix the influence of the performance of the instructors with the effects of the teaching method.⁶

$$\text{EXAM} = -3.39 + 0.12*\text{SCORE} + 0.70*\text{AGE} - 1.92*\text{FEM} - 0.47*\text{F/T}$$

(0.44) (9.21) (4.28) (2.04) (0.25)

$$+ 6.59*\text{USA}$$

(5.71)

[3]

$$n = 581, \text{Adj. } R^2 = 0.14$$

In [3] score and age are significant, the sex dummy is negative and significant and the full time/part time dummy is not significant. The dummy for institution (=1 for USA) is positive and significant which indicates that other things in the equation held constant, higher scores are expected at the University of South Australia.

This result may not be a powerful test of the effects of the difference in teaching methods for a number of reasons. First, the contents of the exam at each institution differed, as noted above. The equation was estimated again using the score for the true and false section (converted to a percentage) as one dependent variable and as another the score for the essay questions (excluding the question which differed across institutions, calculating the average essay score over the remainder and converting to a percentage score). The correlation between scores in each of these sections was 0.41 indicating that the different types of questions are testing different skills. Given the aims of the changes in teaching methods it would be expected that in this sample Adelaide students would perform better on the essay section compared to the true/false section, other things equal.

In the first test of the effect of the separating the scores for each section, the USA dummy was positive but not significant in the essay score equation and was positive and significant in the true and false section. This implies that as expected Adelaide students did better on the essay questions relative to the true and false questions. However overall USA students continue to attain higher scores, other things equal.

A second problem in the data was that there was a different marking team at each institution. Even though both teams were working from the same marking guide, there was still scope for some variation in grades due to the variation between markers. A stratified sample of 20 University of South Australia papers were remarked by members of the Adelaide team (which included two authors of this paper and two other members of staff teaching at the second year level). The results were that on average the Adelaide team was marking each essay question about 2 points in 20 (or 10 percent per essay) below that of the University of South Australia team and were marking each true and false about 0.5 marks out of 3 (or 17 percent over the whole section) below that of the USA team. The USA marks were adjusted by this number of percentage points and the equations estimated again.⁷ The final results are reported in equations [4] and [5].

$$\text{EXAM(T/F)} = -25.17 + 0.144*\text{SCORE} + 1.20*\text{AGE} - 2.60*\text{FEM} + 2.33*\text{F/T}$$

(2.83) (9.87) (6.27) (2.37) (1.06)

$$-2.79*\text{USA}$$

(2.08)

[4]

$$n = 581, \text{Adj. } R^2 = 0.23$$

$$\text{EXAM(ESSAY)} = -1.83 + 0.11 \cdot \text{SCORE} + 0.68 \cdot \text{AGE} - 2.15 \cdot \text{FEM} - 0.97 \cdot \text{F/T}$$

(0.19) (7.04) (3.28) (1.81) (0.41)

$$-8.19 \cdot \text{USA}$$

(5.64)

[5]

$$n = 581, \text{Adj. } R^2 = 0.23$$

These results indicate the true and false section scores were about 3 percentage points lower at the University of South Australia. Scores in the essay section of the common exam were about 8 percentage points lower at the University of South Australia.⁸ The conclusion is that the difference in teaching methods did make a difference to the exam performance of students in these courses. The usual qualifier to this result is that all other things be equal. The econometric methods applied represent an attempt to allow for changes in other variables which might affect the result. However it is not possible to capture completely all the relevant variables and some potentially important variables were omitted (eg overall work load and whether the student was also working in a job). The dummy variable for institution could be picking up the influence of some of those variables.

STUDENT EVALUATIONS

Table 3 reports student evaluations of the course at the University of Adelaide in 1992 and at the University of SA in 1992 and 1993. Students were asked to complete a questionnaire and assess the course according to a number of characteristics on a scale of 1 to 7, that is a range of low to high. A score of 4 was interpreted as 'average'. In 1992, an earlier version of the assessment questionnaire used a narrower scale of 1 to 5 with a score of 3 as 'average'. For the sake of comparison, average scores were converted to percentages (dividing by the maximum score). However the wider range and students' tendencies not to use the whole range complicates the comparison of their assessments of the courses over time.

Table 3 Student Evaluations

		92	93		93
Course Structure	Adelaide	%	%	USA	%
Amount Learned		72	67		68
Workload		75	81		77
Speed		76	76		78
Value of Text		82	79		76
Aims clearly stated		67	63		65
Broadened Horizons		64	64		74
Enthusiasm		60	56		57
Overall Value		68	65		67
Assessment Appropriate		70	65		67
		92	93		93
Tutorial Structure	Adelaide	%	%	USA	%
Tutorials Relevant		77	68		75
Linked to Lectures		69	53		66
Valuable		69	67		75
Stimulating		56	57		58

Comparison of scores across time at Adelaide indicates no support for the change in the structure of the course although the changes in assessment were relatively small. One significant change was the

perception by students that in 1993 the tutorials were no longer linked to lectures, reflecting the change in the ordering of the teaching program. A disappointing result was the relatively low score that students continued in 1993 to give to the question of the degree to which tutorials were stimulating. This is an important issue since the tutorial carried much greater weight than previously in the revised teaching method and also the experience in the small group setting would, it was hoped, have a great influence on students' interest in continuing to enrol in economics course.⁹ This result suggests that continuing work is required on the design of the tutorials and the connections between them and the class meetings. There may also be gains from reviewing other modes of small group meetings.

The low score on some aspects of the tutorials could reflect their design. It could also reflect the management of the tutorials and variations in approach between tutors. In such large classes, there tends to be a large teaching team. Weekly meetings were held at Adelaide to try to coordinate the management of tutorials and there were also a number of staff development workshops during the semester to discuss the issues that arose in the new teaching arrangements. Despite this effort, and given this was the first year of operation of the new system, there was substantial variation in the performance of the tutorial staff, according to student evaluations. These are issues for further analysis (eg analysis of results by tutor, given that students were assigned to tutorials at random).

We also stress that comparison of the scores across columns in Table 3 is complicated since students' characteristics differ. For example, the University of South Australia course scored a higher mark than Adelaide on the question of whether it broadened student horizons. It is not clear whether this is because of teaching methods, the skill of the instructors or the difference between student expectations (which might be proxied by age, sex and entry score) and outcomes. Ideally we would have liked to regress some of these items in the student evaluations against respondents' characteristics. These data were not available on the evaluation form that we used.¹⁰ Without this analysis, much less weight can be placed on student evaluations.

The other issue that arises is the change in the workload. The results from a survey of 70 students at Adelaide all of whom were volunteers indicated that these students were spending about 8 hours per week on the subject outside class time. The average from a similar group at the University of SA was 6.7 hours. These data are not comparable with earlier estimates of time spent on the course since these data reflect the response of volunteers whom we expect would already be interested in the course. However the gap between effort at Adelaide and at the University of South Australia indicates (other things equal) an effect of the change in the teaching method of a rise in effort of about 20 percent, or about 1.3 hours per week. This may understate the increase in effort required by the non-volunteer group who would have been studying fewer hours on average. Even a doubling of workload by the non-volunteer group implies less than 3 hours a week extra work. This greater workload could have a significant effect on effort and therefore performance in other courses. Assessing this effect requires more analysis and data collection and the effect would have to be separated from other changes such as those made by teaching staff in other courses, characteristics of student intake this year compared to last.

In summary, loss of leisure time and the change in the performance in other courses are some of the costs borne by students. The gain is an expected improvement in grades, other things equal. We have attempted to assess here the effects on exam scores and have found that after allowing for differences in student characteristics and marking schemes that students working in the new teaching method did perform better (eg 8 points higher). The value of this increment to scores is difficult to assess. However this increment is not the only benefit expected from the change. A further point is that the change in the teaching method challenged the study skills of students enrolled in the course. In an informal discussion with a small group of students at the end of the semester (another set of

volunteers from the 'group of 70'), comments on the benefits of the course included the important of changes in study habits induced by the different teaching method.¹¹ The skills developed in this semester will be valuable for other courses and later years. Thus the spillover effect on other courses even in the same year could be positive and not negative.

A further target of the changes was to raise the extent to which students retained material which they learnt in this semester. An assessment of this effect will not be available until early 1994 when members of this class enter their second year subjects.

CONCLUSIONS

A change in the sequencing of first year teaching was evaluated against the traditional method by comparing the exam results and course evaluations by groups of students at the University of Adelaide and the University of South Australia. The change was to switch the order of tutorials and lectures and to provide incentives for students to be well prepared for tutorials and lectures (eg an assignment which counted towards final grades had to be handed in before the model to be applied in the assignment was discussed in either tutorials or lectures) and to focus on the development of skills in solving problems and in applying ideas, concepts and models of economics. The change was facilitated by the development of a set of supplementary teaching materials including a study guide for the text book and an interactive computer software package as well as a collection of news clippings including analysis by the authors and sample of student work.

The motivation for the change was to respond to concerns that the students were not working at a rate that might be expected of them, they found the course and the tutorials insufficiently stimulating and retention rates were falling. Another objective was to increase the retention of material learnt. Constraints were to maintain the number of topics covered in the course and to make changes subject to a binding budget constraint.

The plan adopted was to design a new teaching methodology that reflects the dictum 'that the best way to learn economics is to do economics' and to design a new package based on the 'deep approach' to learning, as opposed to the surface approach. Such a methodology would transfer to students responsibility for learning the 'vocabulary and grammar' of economics so that instructor time could be devoted to the higher productivity application of showing how those skills can be used in communication and problem solving. Demonstrating the relevance of economics to current issues and business decision making was also relevant to the objective of raising retention rates in economics courses.

The changes in the teaching methods were introduced in the first semester of 1993 and it is not possible to assess their impacts according to all the relevant dimensions. Work will continue on the effects of the change as students move into the second year units of their degrees. In this paper, we have reported the effects on two aspects, one the exam scores at the end of the semester and, to a lesser extent, the student evaluation of the course.

The effect of the change in the teaching method was tested by comparing the results at the University of Adelaide and the University of SA where the traditional teaching method was retained. Students at both Universities sat a common exam at the end of the first semester. Teaching staff were not the same at the two Universities and it was not possible to test for the effects of differences in instructors.

Their influence will be combined with that of the change in teaching methods. After allowing for observed differences in marking scales, and holding other characteristics constant, it was found that

there was less difference in the scores on the true and false section (or technical section) of the exam (University of SA students achieved lower grades by about 3 points) and that Adelaide students did better by about 8 percentage points on the essay (or problem solving) questions. This suggests that the teaching methods did contribute to higher exam scores especially in the section of the exam where they might have been expected to make a greater contribution, that is, in the section demanding problem solving skills.

Exam scores are affected by a number of variables. These include student characteristics such as entry scores, age and sex. These variables are similar to the fixed inputs into a production process. The change in the teaching method is akin to a change in technology in a production process. An attempt was made to separate the influence of the new technology from the contribution of the fixed inputs. It was not possible to test at this stage the influence of variable inputs such as student effort on exam scores and the interaction between the adoption of the new technology and the change in the variable inputs.

Student workload appears to have increased. The results could be interpreted as showing that Adelaide grades increased simply because the students worked harder. However, it is difficult to separate the effects of this change from that of the change in the work sequence on the outcome. The learning process (eg the order in which students studied various teaching materials, the effects of learning through their own work rather than from lectures) may have affected the results but the incentives to work harder had a compounding effect. Analysis is continuing on weekly survey data from a group of 70 volunteers who reported the times they spent each week on the course and the use of the various course materials. The results will be reported in a later paper.

Greater student effort was one of the objectives of the adoption of the new teaching method but it involves benefits and costs. The exam scores appear to be higher but the short run benefits of the change are difficult to evaluate. The longer run benefits may include gains from the earlier development of new study skills and the greater retention of material learnt, or in other words, positive spillovers into later years. These effects can only be evaluated in later years. On other side, the costs of the change include the value of student time, the effects on grades in other subjects in the current year and other potential spillovers into later years.

There was no observable benefit of the change in terms of student evaluation of the course (by Adelaide students). Their set of evaluations were about the same as in 1992 before the change. In some respects this was a disappointing outcome. On the other hand, average entry scores were lower in 1993 than in 1992 and to retain roughly the same assessment in questions about the 'overall value of the course' while workload increased is a positive result. The weight that can be placed on these evaluations is diminished by the problem of not being able to hold constant other student characteristics. However one message from student assessment is clear. There should be more work done on the development of the new technology particularly on the relationship between tutorials and lectures as well as workshops. This will be the aim of the developments to be planned for 1994.¹²

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FOOTNOTES

- 1 Results reported below indicate that 'technical' questions in an exam (in this case, true and false questions) plus a request to 'explain your answer' were not good predictors of performance in essay questions.
- 2 One of the objectives in the design of the alternative teaching system was as stressed above to maintain the coverage of material in the course, including skill at the application of various models. If this target was not achieved, then there would be a spillover effect on the second year courses where time would have to be taken out to extend students skills.
- 3 The failure rate in this figure is measured at the time of the exam and excludes the 'no-shows' but includes those awarded an academic or medical supplementary in both years.
- 4 These scores have been adjusted for differences in marking scales as discussed below.
- 5 It was reported earlier that in 1993, 39 percent of Adelaide students had a score of less than 390, so that 61 percent had a score higher than 390. At the University of South Australia, only 10 percent of the class had a score higher than 390.
- 6 The impact of instructors could be significant. One model of the choice of appropriate teaching method stresses the importance of the complementary between the method chosen and the skills and personality of the instructor. In this model, there may be no "one way" of teaching first year. The answer is that it depends on the choice of instructor.
- 7 One of the lessons from this exercise is the importance of exchanging exam papers between markers in addition to the preparation of a common marking guide. Also the papers were not double-marked until about 6 weeks about the initial round of marking and there could over that time period still be variation in grades by any one marker.
- 8 An equation with the adjusted essay and true and false scores combined into a single score using the same weights as in equations [1] to [3] was also estimated. The fit of the model with the adjusted scores was higher - an adjusted R^2 of 0.28 compared to 0.14 in equation [3] - and the USA dummy was negative (-6.39) and significant (t value of 5.26).
- 9 This is the 'naive' model of the forces that motivate students to enrol in a particular course. The 'cynical' model is that students will seek courses that permit them to complete the degree in which they are enrolled with minimal effort. In that case, the change in teaching methods assessed is more likely to drive students away than to retain them. However, surveys of employers often reveal that the demands from the labour market are not simply for people with a formal qualification but for graduates with particular skills. Also the survey results of Siegfried and Round reported above indicate student interest in developing problem solving skills.
- 10 Another lesson from this exercise has been the importance of collecting data on student characteristics on course evaluation forms to a significant degree without compromising anonymity.
- 11 An effort was also made during the semester to assist students develop their study skills. For example, a workshop was offered to students on reading skills. This was offered after the lecturers one day in class asked students to open at random then hold up their text books. The opened pages were generally almost completely covered by highlighter pens. The implication drawn was the students were not reading efficiently and not reading with a purpose. Further development of the course materials to deal with this issue is also an objective for work on the first year course for 1994.
- 12 The authors have been awarded a 1993/94 National Teaching Development Grant to make design other features of the course and assess the effects of other changes to the course in 1994.

USE OF PRESENTATION TECHNOLOGY: AN AVENUE FOR IMPROVING TERTIARY TEACHING AND LEARNING

ABSTRACT

Tertiary education has become very competitive and international. Major developed countries have realised its importance, not only as a means of improving the nation's productivity but also as a valuable marketable product overseas. Quality tertiary teaching is being greatly promoted. An avenue for improving the quality of teaching is by using graphics presentation technology. Currently available graphics presentation software includes Power Point, Harvard Graphics, Corel DRAW and Freelance Graphics.

Presentation technology softwares have been around in Australia since the early eighties. The range and quality of products have improved phenomenally since the introduction of Story Board and Harvard Graphics version 1. The keen competition between the suppliers of presentation software has resulted in a great reduction of the learning time. This paper explores the usage of graphics presentation technology in planning and design of lectures in tertiary education. It investigates the impact of this technology on improving tertiary teaching. This study tries to develop a strategy to assist the diffusion of presentation technology amongst tertiary educators. It is hoped all these investigations will contribute, significantly, to the state of the art of research in diffusion technology in the tertiary education sector and in the community.

INTRODUCTION

The appearance of personal computer, PC, on office desks has been increasing at such a spectacular rate that we all expect to see at least a PC in any business office. The great reduction in price and the ease of use of better and more user friendly software has made PC an indispensable tool in business and education. PC should now be seen as a useful tool for creativity rather than an intimidating machine.

The author of this paper has used computers to support teaching in Curtin Business School since 1980. To crystallise her belief that the use of technology can improve teaching and learning, she has developed a suite of presentation lecture modules, for introductory statistics, using Toolbook, an authorware (Ee) 1993. She is familiar with different types of lecture preparation tools like wordprocessors, spreadsheets, integrated packages, authorwares and presentation packages. Through her experience with these tools she can confidently recommend the use of presentation technology to support teaching and learning.

The focus of this paper is on the potential of presentation technology in the area of tertiary education. This paper discusses the use of PC for the preparation and organisation of lecture materials and the automation of lectures. Next it defines the current meaning and status of presentation technology. It then highlights some research findings on the effects of lecture automation on the audience. Lecture automation supports the general aim of using computers to assist teaching and learning known as Computer Aided Instruction (CAI) or Computer Assisted Learning (CAL). Finally, it urges tertiary educators to follow the trend set by business communities

in the aggressive use of this technology. To achieve this, it recommends some actions and research for tertiary education in Australia.

LECTURE PREPARATION AND PRESENTATION

The production of lecture materials is a vital aspect of lecture preparation with the aim to improve communication and understanding. More professionals are turning to computer-based products to increase the impact of their presentations (Kuzmin) 1991. The best presenters are those who are well prepared and present their information in a clear and organised way. Visual reinforcement can help to hold audience's attention, to emphasize a point and to increase comprehension and retention for the audience.

Visual reinforcements come in the form of static or dynamic displays. Several display media are currently being used by presenters. They are hard-copy handouts, overhead transparencies, slides, film strips, video recording and LCDs(liquid crystal displays) or electronic displays . Electronic displays, incorporating rich graphics give the most dynamic visual reinforcements. The computer displays can be projected on to a large screen using a data projection panel or a datashow on top of an overhead projector. Troxell (1993) uses the term 'lecture automation' to describe a lecture where a presenter uses all the peripherals mentioned to produce dynamic computer displays. A presenter may choose one or a combination of a few types of display methods. The choice depends on the sophistication of the presenter and the importance of the presentation.

The concept and the methods of using computer based products for preparing and presenting lecture materials with rich visuals constitute what is known as presentation technology. Currently there is a wide choice of presentation software. The most commonly known are Powerpoint, Harvard Graphics, CorelDraw, Freelance and Cricket.

PRESENTATION PACKAGES

Presentation packages are expected to have features which make them easy to learn and use. They should have standard word processing capabilities including outlining, drawing and graphing and a suite of pictures/drawings (e.g. CLIPART). Features for designing output, managing and arranging displays(slides), choosing the types of transition from one slide to the other, building points (using bullets to invoke key focus progressively), making titles and footnotes are regarded as essentials. Linkages with other software like spreadsheets, statistical or modelling packages and other word processors are desirable. Animation is a powerful feature that will become a standard feature before long.

All the above features have made the preparation of lecture materials, using presentation technology easier than using pen and paper or the typewriter. These features allow more scope for innovation and creativity. The prices of the softwares and the hardware have fallen dramatically, and now, they are at such a level that they are affordable to most academics. All these technological advancements give good reasons for promoting presentation technology in the tertiary education sector. Research shows that there is still a large portion of the community not using the technology.

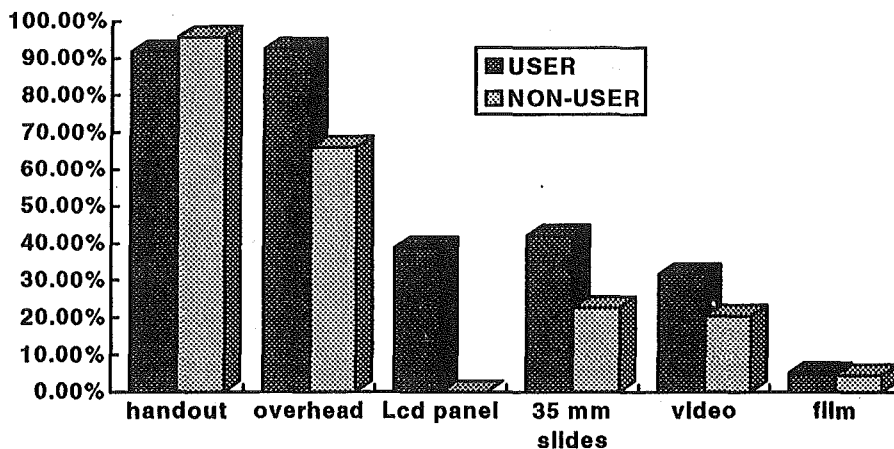
RESEARCH ON VISUAL OUTPUT CURRENTLY IN USE

A national survey of computer end-users in USA by Venture Development Corporation revealed that managers, teachers, and trainers produce their own presentations approximately 70% of the time (Kuzmin) 1991. The survey also shows that hard-copy handouts still represent the most

prevalent visual display medium used. Hard copies, are used, on average in more than 60% of presentations. They are given out, either as primary display form or as backup to other types of visual displays. Almost 92% of the respondents who already use computer-based software occasionally require paper copies for presentations. In contrast, respondents who do not use computer-based software rely on paper hand-outs as their primary form of visual. More than 95% use paper copies in almost 73% of their presentations.

The table below shows that users of computer-based software generally use more visual reinforcements than non users. A possible reason for this could be that users find it easier to produce visual output using the computer as a tool for making the presentation than non users.

Types of output used by people making presentation



ADVANTAGES OF VISUAL AND COLOUR IN PRESENTATION

We will now look at some research findings on visual effects on the audience in the US. There is no Australian data available, however, we can expect that the same results apply here in Australia. Statistics show that audiences remember only 20% of what they hear but 80% of what they see (Barron) 1990.

In a study conducted by the University of Minnesota, presentations, which incorporate visuals were found to be 43% more effective than those, which used no visual aids (Barron) 1990. An additional finding revealed that computer generated graphics were both more focused, concise and more effective in supporting verbal or written information than hand-drawn presentation materials.

Most computer generated graphics are in rich colour nowadays, thanks to the advancement of the technology. Advertising and marketing people are most informed about the effects of colours. Colour visuals have the ability to excite and influence and to heighten retention of printed message (Wayne) 1990. Research indicates that colour is 32% more effective in attracting attention and 25% more effective in causing reader action. Corporate print advertising is usually in colour. Studies in the advertising industry, show that advertisements in colour attract up to 36% more readership than their black and white counterparts.

These findings should increase the incentive for tertiary level lecturers to use computer generated graphics to improve their presentation.

COMPUTER ASSISTED INSTRUCTION (CAI)

The use of computers to support learning, was initiated in the United States in the late '50's and early '60's (Chambers and Sprecher) 1980. The term CAI, used in the United States and the term CAL (computer assisted learning) used in the United Kingdom and elsewhere mean the same thing. The followers of CAI used innovative methods to reinforce course content in the form of simulation, games, tutorials, drills, practices and lecture automation. To be able to develop courses this way the lecturer has to be fairly competent and keen about the use of computer technology.

The more adventurous of them are even talking of "computer classroom" (Kettinger) 1991. This refers to different aspects of integrating the computer into the curriculum. Basically, there are four distinct uses of computer classrooms. They are used (1) as elaborate presentation systems (2) as structured laboratories, (3) as computerised lecture hall and (4) as self-paced classrooms.

A classroom research in California State University, on lecture automation, shows that students obtained better scores when this technology was used than those who received instructions without it (Press) 1991. This supports the case of using computerised lectures (lecture automation) as frequently as possible. Computerised lectures have been used to demonstrate and teach the use of software like word processing, spreadsheet, statistical packages. They are also very effective in providing information, showing applications, generating results and demonstrating data and decision analysis. Lecturers who use lecture automation are usually very confident and familiar with the software.

Generally lecturers in other areas do not feel that comfortable about the use of computers themselves, let alone standing in front of a class. With the current state of the art of presentation technology, one does not need any computing background to get started and to use a presentation package for lecture presentation.

IMPACT PRESENTATION TECHNOLOGY

Research study at University of Arizona, sponsored by 3M, showed that presentation using computer generated visuals are worth the time and money spent in developing them (Johnson) 1993. By using a combination of animation and transition effects, the presenter can persuade an audience and get a message across powerfully.

Using computer presentations at lectures tends to grip the audience's attention and thus provide better communication with the audience. Such presentations have the facilities to focus on key issues and to crystallise conceptual ideas with well designed colourful charts and visual graphics. The audience generally has a better comprehension and retention of the lecture as well as having a more positive perception of the presenter. They perceive the presenter to be better prepared, more professional, more persuasive, more credible and interesting. Finally such presentations increase audience agreement with the presenter as well.

LEADERSHIP FROM THE BUSINESS COMMUNITY

People in business, particularly in sales and marketing of computer products, are the leaders in the use of presentation technology. These people have realised that this technology is a very powerful communication and persuasion tool. They have taken advantage of its power to display to potential clients their products. More and more business people are using this technology to present business proposals, to conduct meetings, seminars and in house training programmes. Their presentations

are usually well prepared, properly structured, well organised and very professional. Audiences who are used to this type of presentation can feel let down when fronting up to a lecture which is devoid of visual support.

In comparison to the business sector, many of us in tertiary education, are falling behind, and are vulnerable to criticism. An effort must be made to improve our presentation techniques. University education in US and England is already facing keen competition from the business world. People are beginning to question "Are Universities Necessary?" Brimelow (1993). Courses and presentations conducted by the business community seem to have more innovation, relevance and vigour. To compete with business outside, tertiary education should regard presentation technology as an avenue to improve teaching and learning.

SUGGESTIONS FOR DIFFUSION

Computer research studies show that presentation software is the third fastest growing area in the personal productivity arena, and it is quickly gaining on word processing and spread sheets which rank number one and two respectively. To promote the use of presentation technology among the tertiary education community, Universities should incorporate the diffusion of this technology into their strategic plan.

Firstly staff should be made aware of the advantages of using the technology and then be encouraged to use it. Demonstrations of how this technology can impact on particular teaching areas can be arranged for different disciplines. Staff in these particular areas can be encouraged to comment on and to evaluate the outcomes. Concrete support in the form of advice and financial assistance on the purchase of hardware and software should be made freely available. Initial personalised technical support to induct the first timers into developing their first lectures using the technology can be introduced. Efforts and innovation made in using presentation technology for improving lecture presentation should be recognised and be considered in staff career development and promotion. Universities should also ensure appropriate technical and peripheral support for improving quality and productivity of lecture presentation. Research in the diffusion of presentation technology should be encouraged. Important implications on diffusion of the technology for improving university teaching and learning could be drawn from the research findings.

CONCLUSION

Presentation technology opens a new avenue to improve the quality of teaching and learning in Australian tertiary education. To be competitive and international we need to be ahead of the rest of the world in our innovation and creativity in lecture preparation. Using this technology, we are forced to focus the lecture objectives better and to be more structured, organised and productive. This in turn will improve the quality of our offerings to students and thus win for us a leading edge in tertiary education.

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APPENDIX (OUTLINE FORM OF THE ACTUAL LECTURE PRESENTATION AT THE TEACHING LEARNING FORUM 94 USING POWERPOINT)

USE OF PRESENTATION TECHNOLOGY : AN AVENUE FOR IMPROVING TERTIARY TEACHING AND LEARNING

Lian Ee

Curtin University of Technology

Quality in Teaching and Learning
'Making it Happen'

TEACHING AND LEARNING FORUM '94

PRESENTATION TECHNOLOGY

COMPUTER BASED PRESENTATION PRODUCTS

- Use of a PC to prepare and organise lecture materials
- Lecture materials
 - Printed handouts
 - Overhead transparencies
 - LCD (electronic) displays
 - Slides
 - Videos and Film strips

Types of output used by people making presentation

LECTURE AUTOMATION

THE PRESENTATION OF LECTURES USING

- A computer software
- Data projection panel (LCD display)
- Projection Screen
- The presenter

CURRENT STATUS OF PRESENTATION TECHNOLOGY

- Wide range of choice
 - Powerpoint, Harvard Graphics, Cricket, FreeLance,
- Easy to use tools and capabilities
 - outlining
 - word processing
 - drawing and graphing
 - linking
- presentation management
- Easy to learn
- Affordable

COMPUTER ASSISTED INSTRUCTION

- Computer Assisted Instruction
CAI in USA
- Computer Assisted learning
CAL in UK and elsewhere

THE USE OF COMPUTERS TO ASSIST IN LEARNING SITUATIONS

- USE OF COMPUTER TO PROVIDE COURSE CONTENT IN THE FORM OF:
 - Simulations
 - Games
 - Tutorials
 - Drills and Practices
 - Lecture automation

LECTURE AUTOMATION

- Demonstrate the use of a software
 - WORD PROCESSING, SPREADSHEET, STATISTICAL PACKAGES
- Provide information
- Show applications
- Generate results
- Data and decision analysis
- Lecture presentation

PRESENTATION TECHNOLOGY PROVIDES RICH VISUAL EFFECTS

- GRAPHS
- CLIPART
- ANIMATION
- TRANSITION
- COLOUR

VISUAL EFFECTS

Statistics show that audiences remember only 20% of what they hear but 80% of what they see. Presentations incorporating visuals were found to be 43% more effective than those which use no visual aids.

VISUAL VERSUS HEARING WHAT IS CLIPART? COLOUR'S ABILITY TO EXCITE AND INFLUENCE

Research indicates that:

- COLOUR is 32% more effective in attracting attention
- COLOUR is 25% more effective in causing reader action
- COLOUR attracts 36% more readership than black and white counterpart
- COLOUR heightened retention of presented message

IMPACT OF USING LECTURE AUTOMATION

- Grips audience attention
- Improves communication
- Improves comprehension of information
- Improves retention
- Focus on key issues
- increases agreement with presenter
- Audiences perceive presenter to be
 - better prepared
 - more professional
 - more persuasive
 - more credible and interesting

PRESENTATION TECHNOLOGY IN BUSINESS

THE USE OF PC IN BUSINESS PRESENTATION HAS BECOME THE NORM

- Sales and marketing
- Business meeting
- Business proposals

RECOMMENDATIONS FOR ITS USE IN TERTIARY EDUCATION

- Expose faculty to the benefit of using the technology
- Departmental support for hardware and software
- Initial personalised technical support
- Recognition for staff effort in using lecture presentation to improve teaching
- Strategic plan to encourage its use

RESEARCH IN DIFFUSION OF THE TECHNOLOGY

- Survey of current usage
- Profile of users
- Profile of potential users
- Measure of effectiveness
- Strategy for diffusion

ORIENTATION & TRANSITION TAKES MORE THAN A WEEK: WHAT UNIVERSITIES CAN DO ABOUT IT

INTRODUCTION

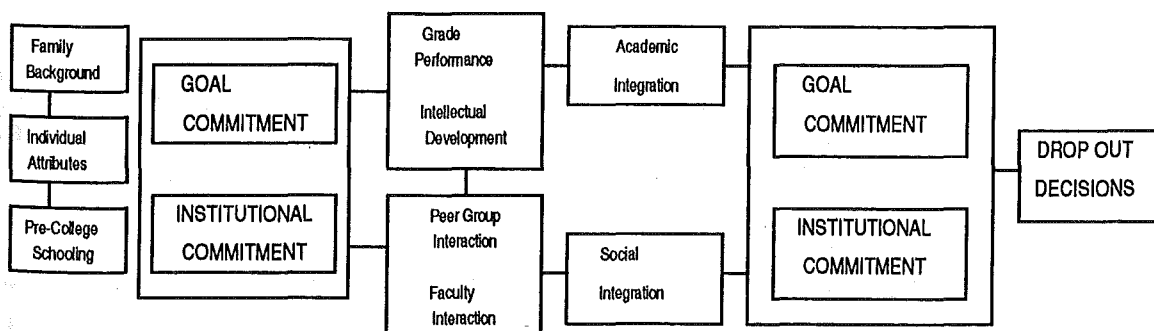
It is a widely reported finding throughout the world of higher education that a significant proportion of entering students do not persist with their studies. While precise figures vary from study to study, Cuseo (1991: 1) observes that almost 40 per cent of American students leave without obtaining a four-year degree. In summarising a wide body of research, he further notes that at least half of the students who do leave will do so in their first year at college - and that the majority of this group will depart in their first six to eight weeks of attendance. These statistics are alarming.

This paper will present some data on how institutions have responded to this issue in the North American context. While there have been efforts made in Australia to deal with problems of retention and attrition, it is not the intention of this paper to look at those. Some evidence in evaluating intervention programmes will be discussed. Finally, there will be some conjectural discussion on what may perhaps be considered in the Australian context in the light of this experience. Much of the information to be presented was derived from the writer's recent visit to the University of South Carolina. At this university, there is the National Resource Center for the Freshman Year Experience, directed by Professor John Gardner. The Center has been influential in placing the issue of orientation, transition and student success high on the agenda of many American colleges. Further, the Center has acted as a clearing house for much institutional research.

THE NATURE OF TRANSITION

The successful or unsuccessful adjustment to higher education is not an overnight process. Tinto's 1975 model acknowledges the complexity and the interactive nature of what occurs. Figure 1 illustrates in diagrammatic form the broad outline of the variables of apparent significance.

Figure 1: Tinto's Model of the Dropout Decision



Of course, incoming students do not arrive at university without influential variables already in place. These are characterised as Family Background variables, Individual Attributes, and Pre-College Schooling. Family Background may include such qualities as parental expectations, socio-economic status, membership of a particular ethnic group. It may be the student is the first

generation of the family to attend university. Conversely, there may be a family tradition of higher education. Pre-College Schooling will include the quality of educational preparation, peer group influences and so forth. Individual Attributes may be aspects of personality, intellectual ability, physical abilities, self-esteem, career development maturity and the like. The sum of these variables means that individuals arrive with varying degrees of congruence with the expectations and value patterns of higher education. Some "fit in" better than others without much adjustment required; some are better able to make the necessary changes. It is acknowledged that the power of institutions to influence pre-university variables is somewhat limited - although not entirely zero. However, a reality of at least the North American context is that much of the input given to students by institutions before arrival at college has a marketing and recruiting purpose.

Once at the institution, the two commitment variables are extremely significant. The goal commitment of the new student is critical. That is, the answer to the broad question "why are you at college?" must be one that is meaningful to the student. The nature of the goal commitment, and the strength with which it is held are both important. For example, being at university to please one's parents may or may not be sufficient reason to remain - possibly depending on the continuing motivation to please them. To be at university for more intrinsic reasons connected to one's own life goals may be a more powerful commitment. Equally significant though is the institutional commitment to new students. It is quite possible for a university to convey an impression to new students that they are little more than "cannon fodder" - backsides on seats to fill quotas. Likewise, institutional practices may make it clear to students that they are welcome and valued members of the academic community.

Chickering, Gamson and Barsi (1990) have developed inventories of good practice in undergraduate education which deal with this latter issue. There are three inventories, directed at the institution, the faculty and the student. Each inventory has seven items, and each of the seven items contains a ten point checklist. In all three cases, the items are summarised thus:

- "1. Good practice encourages student-faculty contact
2. Good practice encourages co-operation among students
3. Good practice encourages active learning
4. Good practice gives prompt feedback
5. Good practice emphasises time on task
6. Good practice communicates high expectations
7. Good practice respects diverse talents and ways of learning"

Chickering, Gamson and Barsi (1990:11)

Where institutions observe a less than desirable retention rate, it can be instructive to measure both faculty and institutional commitment against these criteria.

Throughout the student's time at university, both academic and social variables influence potential dropout decisions. A student's actual performance may lead to either a voluntary or involuntary movement out of university. The intellectual development of students may or may not be congruent with the demands of the particular courses being studied. The nature of interactions between peers, and those between staff and students can contribute to appropriate adjustment or to a decision to leave. These forces may not all act in concert - indeed they may be conflicting. Students may have a wonderful (and brief) social time at university while academic requirements are not met.

The continuing nature of these variables and their interactions involve periodic and/or on-going review of the commitment. The overall picture may be confused. Ultimately though, the situation is reduced to a single issue - to continue or not to continue. While the final measure will be some figure which summarises retention rates, for any individual the contributing factors to a decision to leave may be complex and poorly understood by the student (and significant others in his/her life).

Tinto's model, and other research referred to elsewhere in this paper support the notion that effective intervention in these variables can make a difference to retention rates. The general theme is that enhancement of academic integration and social integration over a reasonably lengthy period (a semester or more) will influence a greater proportion of students to remain within the university. In the next section, institutional responses to this are examined.

INSTITUTIONAL RESPONSES

American colleges and universities have, in many cases, responded to student attrition by introducing semester long units with titles such as "University 101", "Transitions: The First-Year Experience", "College Success", "The College Experience Seminar", "Academic and Career Exploration 100", and the like. According to Barefoot (1993:7) roughly two-thirds of colleges in the USA have freshman seminar or student success courses of one sort or another. Barefoot & Fidler (1991) surveyed 2,460 institutions in 1991. Of these, 1,064 responded with data on their offering. The analysis offered is broadly statistical in nature, looking at such variables as types of seminars, length, course goals, group sizes, methods of grading, types of instruction, instructor training and so forth. The report also includes qualitative findings and a statement of implications for future policy and practice.

By far the majority of these transition courses are less than ten years old, although the first "coping with college" seminar did appear at Boston University in 1888. The first "for academic credit" course appeared at Reed College in 1911. The present situation seems largely inspired by research conducted in the 1970s and 1980s, in particular influenced by the leadership shown by John Gardner and his associates. The current offerings are most typically full semester credit courses (over 80% of institutions give some academic credit towards graduation for these courses), with one two or three hour (or occasionally more) per week commitments. Some are required (about 44% require the course to be taken by all students), others are offered as electives.

While the actual content of these courses shows some variation, the most common course materials addressed will include a reasonable sampling of the following:

- * Reasons for attending university,
- * college structure & specific institutional information,
- * staff as a resource, and how to use that resource,
- * time management skills,
- * lecture note taking,
- * effective reading skills,
- * studying for exams,
- * library research,
- * writing papers, thinking logically & analytically,
- * computer skills,
- * relationship issues, responsible intimacy,
- * healthy lifestyle,
- * substance abuse,
- * stress,

- * values clarification,
- * racial & ethnic minority groups,
- * gender issues,
- * non-traditional students,
- * students with disabilities,
- * career planning.

There are also the process variables of creating a peer support group and faculty mentor(s) which are significant parts of most freshman seminars. It is widely acknowledged that the simple presentation of the factual information implied in the above list is not sufficient in itself. If this were so, students could be given appropriate printed material and be left to discover what information they need relatively unsupervised. Rather, it has been shown that the experience of participating in such a transition course is also a critical variable in assisting new students.

Some significant variations of the style of help offered does exist. For example, some courses are residential-based programmes rather than specifically part of the academic course load (see Zeller, Fidler and Barefoot, 1991). Some exist as separate courses open to any new student, whilst others are structured for the needs of particular faculties. There also seems to be some variation in whether such courses are graded or pass/fail.

RESEARCH EVIDENCE

"Because freshman seminars represent a non-traditional curriculum reform, they encounter frequent resistance from the gatekeepers of the formal curriculum and must therefore prove themselves in order to survive. Freshman seminars (and their participating students) have been studied, measured, and evaluated more often than has been the practice for any other course in the higher education curriculum". (Barefoot, 1991:7)

Barefoot (1993) has assembled a total of 34 evaluation studies on the outcomes of freshman seminars. Typically, the measures sought are retention and grade point averages. However, other measures have been involved in many cases - e.g. the effect on teaching style, impact on student's self-perceptions as learners, and several others. Her report does not combine the studies into any overall finding, but presents them as individual institutional pieces of research. The text is organised by college size: programmes at two-year colleges, small colleges, mid-sized colleges, and large universities. Not all of the research is necessarily rigorous. However, the broad trend of this research indeed shows that freshman seminars have a positive impact on the variables in question.

A study which is comprehensive and rigorous is that conducted by Paul Fidler (1991 and 1992). This study is an evaluation of the University 101 programme at the University of South Carolina using longitudinal data collected since the course's introduction in 1972. The nature of this research has been to compare participants and non-participants on a number of key variables over this time. Fidler had two key research questions:

1. To what extent is participation in University 101 associated with a higher sophomore (i.e. second year) return rate?
2. If a differential return rate is observed, what intervening variables account for the results?

The findings strongly support the contention that participation in University 101 is indeed associated with higher retention, and that this may be attributed to the process and content of that course. There has been no year since the course was introduced when the retention rate for participants was

lower than for non-participants. Participants achieved statistically significant higher second year return rates in 11 of the 16 years studied.

An important part of the study looked at predicted grade point averages (GPA) of participants and non-participants. In general, participants have been those with lower predicted GPAs. The results showed that participants achieved higher than predicted grade point averages. That is, their return rate appears even better in the light that it might have been expected that this group would do worse. In fact, the broad profile of participants would indicate a more "at-risk" group on a number of entering variables. For example, participants were more likely to have a high school "C" average, to come from less affluent families, are less likely to join a fraternity, more apt to be female, black, non-local resident, younger, and carrying a generally greater course load. It could reasonably have been expected that this group would have a worse retention rate, when in fact the reverse was the case.

A common criticism of evaluation studies of transition courses is that it is assumed that brighter, more highly-motivated students self-select into the course. Fidler's research demonstrated that this is not the case. For example, survey data from 1988 show no significant difference between participants and non-participants in their general motivation to stay in school and complete their degrees. Accordingly he asserts that the results indicate that the better return rate was because of the process and content of the course itself rather than already present qualities of the participants. The longitudinal data also seek to control for the influence of the variables of race and sex. Fidler found that regardless of race and sex, University 101 participants were likely to show a higher return rate.

More qualitative data from surveys show that participants were likely to be more aware of and to use various campus resources such as key personnel, services and activities. Participants were more likely to report they had received good orientation and to feel they could comfortably seek help.

Data strongly support the notion that the introduction of University 101 type courses are an effective way of intervening to improve retention rates in the North American context. Given that it is difficult to convince administrators and academic staff to commit resources to such projects, it is significant that such a large number of institutions have done so. Further, it has been widely reported that such courses have improved student retention rates. In the next section, the possibilities for the Australian context will be discussed.

WHAT MAY BE ADDRESSED IN AUSTRALIA

Like North American institutions, Australian universities have similar problems with first year retention. It seems difficult to refute the contention that the introduction of transition courses would have a positive effect on this issue - but there are potential difficulties.

The higher education sector in the USA is different in some respects to the situation in Australia. A key difference is that there is a much wider availability of general liberal arts courses at undergraduate level in the USA. By contrast, in Australia it is far more common for students to directly enter professionally oriented degree courses. For many of these courses, the array of units is so tightly organized that it is hard to see where a transition unit may fit. We may assume that a transition unit typically would take about one fifth of a student's time in first semester. If students were to be encouraged or required to take such a unit, some rearrangement of the remainder of the course would have to occur.

There are a number of possibilities that may address this. It may be worth considering whether all parts of a current first year course load are necessary. Perhaps some things could simply go. Of course, it is to be expected that there would be some opposition to this kind of proposal. An alternative would be to rearrange the structure of units in some way so that space is created for a new unit. An advantage of this approach is that no part of the current professional content of a course is removed. However, it does in effect mean that students would have a bigger course load in that the total course, in effect, would be one unit larger.

A further possibility is to select the more appropriate elements of a transition unit and to incorporate that within the first year offering in some coherent way. This could be done either by discarding some aspects of some units or by adding further topics to one or more units. Clearly, an outcome is that either some current elements of courses would not be taught or would be taught in a less comprehensive way.

It is probably somewhat optimistic to hope that all departments within a university could be convinced simultaneously of the desirability of any of the above alternatives. Another option is to introduce such a unit as a generally available elective and to allow students who do have flexibility in their courses to take it. In time, it may be that an increasing number of departments will perceive that the success of the unit would justify some modification to their current course structure.

There is one circumstance where courses with little room could accommodate a unit of this nature with little pain. Such a unit could be offered as a second semester unit available to students who have failed a sufficient proportion of first semester as to be unable to continue with a full-time load. In this case, the transition unit would work as a remedial unit. It may be set as a requirement for students whose continuing status is in doubt because of first semester failure. It may also be offered to terminated or dis-enrolled students as a means for establishing a case for readmission to their course. However, this proposal changes the nature of the course. A remedial unit of this sort gathers together students with a "stigma" after the event of their failure. It does not seem to be as useful as the preventative measure of a first semester transition unit. Nonetheless, it may be the most politically feasible option.

If students are to respect the content and purpose of units of this type, there is no question that there must be academic credit available towards graduation. It is sometimes proposed that the content of transition courses can be addressed in other ways that do not involve formal enrolment in an academic credit course. That is, we can offer workshops, volunteer seminars, orientation camps, bridging units, study skills groups, writing courses, counselling and so forth - more or less as most institutions currently do. Students may then take what they think they need as an additional activity to their course enrolment. While this is not an entirely useless approach, it is to be expected that this "voluntary cafeteria" method would be rather haphazard and not as effective as a more formalised offering.

Offering courses with credit may present problems to an institution. It must be shown that the course content and process is academically "respectable". We naturally do not wish to provide credit points for a "Mickey Mouse" course. The trend in the USA towards offering these courses on a graded basis is an attempt to meet this problem. While these courses do improve retention rates, it is entirely possible for a student to fail on academic grounds. If the content is rigorous and the assessment sound, there is no reason why it cannot be regarded as worthy of academic credit.

In the Australian context, there are administrative issues which would flow from a decision to run a transition unit. As soon as there are credit points involved, the unit is liable for HECS charges. Patently, HECS charges do not meet the real cost of running any unit. That is, further funding

would have to come from somewhere. We do not live in a time of budget largesse and financial munificence. Great consideration would have to be given to how such a course is funded. Presumably the options are to re-allocate resources from within the institutional budget (hardly a popular move) or to seek special funding for it. Neither is an easy option.

Another administrative issue revolves around who would teach the unit. It has been found that best results come from involving volunteer faculty staff from all areas - although some specialist staff are employed. The logical outcome of this is that either staff accept an increased workload or that extra staff are engaged. The first of these cases has industrial implications, especially in a time where staff already observe greater teaching loads. The second option obviously involves funding. In the case of using faculty staff, there is also the issue of appropriate training to be considered - although Gardner (1992) has devoted some energy to this problem. Training too involves time and funding.

A related administrative issue is the question of who would "own" the unit. One option is that the transition unit could be run by an independent area on campus. There are advantages to this such as economies of scale in administration, and involving mixed groups of students from varying backgrounds. Elements of course content could potentially be varied to suit particular major areas of study of individual students. The alternative is that department areas develop and teach their own transition units to suit their own professional area. A disadvantage of the latter approach is that it almost necessarily discourages consideration of different career options by students.

On the whole, the potential difficulties seem substantial. So, why bother? The answer lies in the experience of others. It will improve retention rates. It will provide better outcomes for students. It will enhance attitudes towards learning and provoke involvement between faculty and students. To do nothing is to be and large accept that transition and retention are not an institutional responsibility - and that is an arguable point.

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TEACHING PRACTICAL AND EXPERIMENTAL WORK: EVALUATING ALTERNATIVE DELIVERY STRATEGIES

ABSTRACT

This paper describes an evaluation study conducted at the Open University, UK in 1993, to explore the role of home experiment kits supplied to students studying a foundation course in science, at a distance. The Science Faculty at the Open University, UK plans to rewrite their science foundation course. This course was first developed in the early 1970s and has undergone two major revisions in the last twenty years. The course components include a box containing materials and equipment which is sent to students in two parts early in the year. This box is called a home experiment kit (HEK), and gives students an opportunity to carry out practical and experimental work related to the course. The kit aims to help students develop scientific skills and to reinforce and build on concepts and procedures introduced by other components of the course. The kit is also seen as an important motivator, to maintain student interest and enthusiasm for studying a science course.

The researcher, attached to the Open University's Institute of Educational Technology as a visiting academic, was asked to conduct an evaluation "on what role, if any, the current type of HEK should play (in) the remake of the current science foundation course" (Lockwood, 1993, April).

This evaluation study is based on information collected from 84 interviews with past and present students, university staff, a professional organisation and staff from another institution as well as an interpretation of existing data, mainly responses to questionnaire surveys conducted over a period of fifteen years.

The study recommends that the existing home experiment kit supplied to students could be replaced by an amalgamation of various alternative delivery strategies. The paper explores these delivery strategies and outlines their key advantages and disadvantages in the context of distance and open learning students.

INTRODUCTION

The Science Faculty at the Open University plans to completely rewrite the science foundation course, S102. This course was first developed in the early 1970s and has undergone two major revisions in the last twenty years. The course components include a box about the size of a tea chest containing materials and equipment which is sent to students in two parts early in the year. This box is called a home experiment kit or HEK and gives students an opportunity to carry out practical and experimental work related to the course. The kit aims to help students develop scientific skills and to reinforce and build on concepts and procedures introduced by other components of the course. The kit is also seen as an important motivator, to maintain student interest and enthusiasm for studying a science course.

Certain activities based on the use of the kit have computer marked assessment and the outcome of one activity is tutor marked. It is important though not always essential for students to complete these activities in order to pass the course.

The researcher, attached to the Institute of Educational Technology (IET), for two months as a visiting academic, was asked to conduct an evaluation "on what role, if any, the current type of HEK should play (in) the remake of the current science foundation course" (Lockwood, 1993, April).

RESEARCH BASE

This report is based on information collected mainly from interviews with 40 past and present students and 41 university staff, two staff from a professional organisation and a member of staff from another institution as well as an interpretation of existing data, mainly responses to questionnaire surveys on various earlier versions of the science foundation course (S100, S101 and S102).

It was not seen within the scope of this study to answer questions concerning the contribution HEK plays in helping students to learn, but is more to do with the marshalling of opinions and proposal of recommendations on the basis of representing a broad constituency of these views.

The interview method of collecting information was considered preferable to distributing anonymous questionnaires because the researcher wanted to generate a more open ended discussion on the role and importance of HEK.

The researcher initially contacted a few university staff who acted as key informants, to help identify persons who were qualified to be in the sample. These were then verbally requested by staff for permission to be interviewed by the researcher.

Interviews were carried out during a two month period by phone and face to face, after tutorials, at home, in the workplace and during Summer School and Practical Day School.

Most of the Summer School and half of the Practical Day School interviews were conducted within hearing range of other students or tutors. Interviews with these students were more informal than other interviews.

To ensure variety, staff and students in the regions of the South West, East Anglia and London were interviewed and a reasonable urban-rural, gender and age balance was maintained.

The instrument employed for the study was an interview guide with ten open ended questions. The semi-structured nature of the interviews allowed informants to pursue any area of the inquiry about which they felt strongly. The open ended approach encouraged respondents to draw their own conclusions about their experiences. After the initial interview, a few follow-up discussions were made to a number of student and staff interviewees for clarification or for further elaboration. The interview guide included such topics as HEK usage, its effectiveness and value, the importance of seeing and doing practical and experimental work, student orientation to study, access to various technologies and the relationships between HEK, Summer School and Day School and other components of the course.

Interviews were mainly set up by an initial phone call followed by a face to face meeting. An audio tape recorder was used whenever possible during interviews to give the researcher a second

more in-depth opportunity to go through the content of each interview. Interviews were from 10 minutes to over 60 minutes in duration.

LIMITATION OF THE STUDY

In recording and interpreting data the researcher recognises that his opinion will be reflected in the study. In collecting and in writing up the report the researcher took into account the following assumptions that:

1. "As a foundation course, S102 forms a basis for higher level science courses" but S102 "is also written for those who do not plan to study science further." (S102 Introduction and Guide, 1987, p.4). That S103 will cater for similar needs though with a possible change in emphasis. That the new course will aim to raise "the popularity of science", attract and maintain the "interest of large numbers of students" and provide "a route to further science courses" (Bennett, 1993).

And that:

2. Students need to develop skills of "scientific inquiry"; "process skills" of "observing .. measuring .. modelling .. hypothesising .. interpreting" and "drawing a conclusion"; and "on building scientific concepts" (S102, Introduction and Guide, 1987, p.26-27), and that these skills and concepts are either reinforced or acquired by students seeing or doing certain practical and experimental work.

FINDINGS

Given that practical and experimental work are essential components to a foundation course in science, a critical question to ask is - what is the most efficient and effective way of getting students to do this work?

If the Open University were starting afresh without the history of S100, S101 and S102 would it develop a very different course with very different course components? There is perhaps a danger that what was here before and what works is often the basis from which decisions are made for a new course. Any major changes to S102 will probably require large numbers of staff to be retrained, including the many part-time tutors in the regions. This in itself could mean that the course development team would tend to avoid being too radical with its decisions about the new course.

The present S102 HEK does have some excellent activities built-in. It is without question, a well tried and proven resource. *However, the question must be: if the new course still requires the same or similar activities as found within the HEK, is the HEK still the best, the most suitable way of getting students to do that work?*

The kit itself is bulky and many students have problems finding space to set up and carry out HEK practical and experimental work, especially during activities that take considerable time to complete. Safe storage, especially in homes where room is limited causes major problems.

However, most students said they liked the kit:

I "like placing test tubes in a rack, (etc)... It makes me feel like I'm doing what a real scientist does doing 'scientific work' using 'scientific equipment'."

"the physical mixing of chemicals gives me a real feel for the subject."

HEK "helps get across some of the more difficult concepts. This is especially useful for those students with no previous experience of science."

"This idea of it's fun counts for a lot and I'm sure quite a lot of people do the course 'cos of the chemistry kit (laugh). It's like the toy chemistry kit you never got for Christmas."

HEK is "quite comprehensive, well presented, virtually self-contained, pleasing and well set out. The question is how much of it is necessary. And how much is actually just adding to the glamour of having a science kit?"

Most students do some of the HEK activities; a few do them all while others, due to time commitments and other reasons, complete just the Tutor Marked Assessment activity and perhaps one or two others. As three students put it:

"S102 is too busy there's too much in the course ... and not enough time to do all the experiments... everything is too rushed."

There is not "the time to do experiments apart from the TMA one.....Most other experiments I considered were a luxury."

"I completed the essential experiments but didn't bother to do them all."

Some students, particularly those new to science find the large kit and its contents daunting. In fact some students never open the kit at all. (It is important to note that this information is based on interviews conducted in May, June and early July, 1993. The fact that some students have not opened the kit to-date, does not exclude the possibility of some students using the kit in the time after the interviews and before the end of the course.)

The problem of inequitable access; that not all students received the kit, for example, the European Community students, was seen as another reason to radically rethink the HEK role and to carefully consider what could and should be included in a kit, if one was supplied with the new course. As one Open University member of staff said:

"Can HEK really be effective when only a part of the kit can be sent to some students?"

Students from European Community countries, an increasing potential student catchment area for the Open University, cannot be supplied with the kit due to problems crossing international borders with chemicals, etc. These students attend Day Schools held in regional areas to observe and carry out practical and experimental work.

The kit itself is expensive. For example, the 1993 costs for the dispatch and return of the kit is estimated at £80,000; warehouse labour costs for handling and repacking is between £150 - £200,000; annual maintenance, cost of procurement of replacement items is approximately £50,000; repacking and replacing the outer carton each year costs £10,000. With a projected increase in science foundation student numbers in 1994, an estimated addition of £100,000 will be needed for new kits to be made. (The chemistry balance supplied in HEK costs approximately £100 each). The original cost of the kit for 8,000 students in 1971 was £1 million. A new or revised kit for S103 would undoubtedly be expensive to procure, supply and maintain. (Dunford, 1983 & Blunt, 1993)

The question again is: is HEK in its current form the most effective and efficient way to deliver practical and experimental work? The researcher believes that if the new course requires similar activities to those found in the existing course, then an amalgamation of some of the following alternative delivery strategies would adequately replace the present HEK.

A KIT, PREFERABLY NON-RETURNABLE, NO LARGER THAN THE EXISTING S102 HEK PART 1.

Students and tutors stated that they found some very useful and educationally sound activities with S102 that use equipment and materials supplied in part by the student and in part by the kit and it was felt that there were certain exercises and activities, skills and concepts carried out and taught through the HEK that could not be done as successfully by other means. For example, HEK gives students opportunities to handle and appropriately use scientific apparatus. Certain skills in selecting and carrying out certain procedures using the correct equipment and materials supplied could not be done easily by other means - for example, by students solely supplying their own resources.

This view, however, did not negate the value of using Day Schools to provide the hands-on exercises using the more complex scientific measuring devices required on the course.

The researcher considers that more of the present HEK activities could be completed successfully in part by requiring students to supply at least some of their own resources with the university supplying a minimum amount through a greatly reduced kit.

An Open University, Walton Hall member of staff takes this view further:

"Early in the Foundation Course lots of simple practical work is needed, in part, to overcome 'fear' of science, to gain motivation and to evoke an understanding of the nature of science. In the first half of the new foundation course it would be good to see experiments that stressed the learning of scientific techniques and experiments with starting points from the students experience; something students can understand and relate to, for example how shower gel is made thicker, In this way the HEK supplied to students in the initial year could be a 'a throwaway' non returnable kit, with much of the initial equipment and substances supplied by the student."

It should also be noted however that if students are not given a kit and are expected to find or purchase materials to carry out practical and experimental work, they will be less likely to do the work or activity. As one student put it:

"Getting all the right glasses etc for the experiments as in chemistry....if we had to supply the equipment ourselves....well I won't have the time or inclination to do the experiments."

A tutor reinforces this point:

"If the HEK goes and students have to buy or find objects, chemicals etc. they'll have problems. For example, shops don't sell them or certainly not universally standard things. And asking students to go out and find an extra item or two may well put students off doing that experiment." This tutor who also teaches the introductory science course, Intoscience noted that students often "didn't do the experiments because of a lack of time or because they couldn't find the appropriate bits and pieces ..."

The question of whether a new kit should be returnable or non-returnable would depend, in part, on the kit contents. Obviously, if expensive equipment or materials such as rock samples were included, the kit would need to be returned.

DEVELOPMENT OF ACTIVITIES WHERE EQUIPMENT AND MATERIALS ARE SUPPLIED BY THE STUDENTS.

In developing the new foundation course, more consideration should be given to providing practical experience based on equipment and materials that could be acquired easily by the students themselves. A student stated that doing the practicals in S102:

"makes you think and makes you realise that scientific experiments are often carried out using simple non-expensive equipment. It's useful to know how to do things without sophisticated equipment. Measuring the moon experiment is one example I didn't use the discs supplied in the kit to do this experiment ... the kit arrived too late ... and anyway, I didn't really need them..."

A tutor supports this view and goes on to say that:

"If HEK is taken away, would students feel cheated? If the course is restructured to give students opportunities to experiment using everyday objects - found in house or easily bought students probably won't feel cheated in the early part of the course."

An Open University, Walton Hall member of staff agrees:

"Can you design experiments with almost no apparatus? You can. For example, you can measure the acceleration due to gravity. You can drop something out of a window, time it, throw it out of a second floor and time it, and so on."

Another tutor however notes that:

"Students can't be expected to supply their own materials and equipment...they'd never do the experiments..... it would make it too difficult and time consuming."

Other tutors expressed their concern about the course credibility if the kit were to be entirely abandoned. One tutor who works closely with colleagues from conventional universities noted how "sneering" they were about the Open University's course because of the lack of practical work. This tutor felt that if the kit were removed, the course would be further downgraded in the eyes of other science educators. Another tutor noted:

"The kit could be written out. But if the kit is taken out, how credible is the course as a science course? ... But then again, how credible is it with the limited kit anyway? Compared to conventional university courses, it's minimal."

INSTRUCTIONAL VIDEO, AS DISTINCT FROM BROADCAST TV TO REPLACE CERTAIN TYPES OF ACTIVITIES REPRESENTED IN THE EXISTING HEK.

There are some activities in the present HEK that require students to observe, record, then write up their findings. The goal in these activities is in *seeing* and *reporting* rather than *doing*. Since most students have access to a TV and video recorder, seeing and reporting activities may well be suited to video and text type materials with focus questions and activities for students to do before, during and after watching the video. A student agrees:

"Personally, I'd have no regrets through the loss of the science equipment. I think there are other ways you could do it. For example, having Science days on a Saturday.....Or maybe a video where you could maybe see someone do the experiments and you could see them make all the measurements on the video and you just take notes of what you've observed."

Another student states:

"You could do away with the chemistry kit completely, replace part of it with a video. To be quite frank with you, it would probably be a lot more useful to students than actually doing the experiments themselves, 'cos there's always the thing when you're doing it, 'I don't remember seeing that!' whereas if you've got somebody doing that on video and saying 'Notice the x, y or z,' it would be difficult to miss it. Guided experiments would be a lot more practically useful than doing the experiment yourself and on your own. Video experiments could well replace certain demonstration style experiments"

These instructional videos - as opposed to the TV broadcast materials - could be produced in short clips, of 2 - 5 minutes and interrelated with text activities, etc. Tutors may well find it easier to assess student understanding and abilities, as the phenomena recorded on video would be standard and unchanged.

A disadvantage, of course, would be precisely that the phenomena would be standard and unchanged. In conducting experiments and in doing practicals in science an important element is that of uncertainty; that theories when tested in practice do not always reveal the 'right' results; results that come close to those generated by the theory.

The video demonstration has therefore a limited use and cannot replace HEK activities that require students to actually do hands-on work, though it may successfully replace some seeing and reporting type activities.

EXPANDING THE ROLE OF DAY SCHOOLS WHICH FOCUS ON PRACTICAL AND EXPERIMENTAL WORK AND REPLACING SUMMER SCHOOLS.

An increasing number of Open University regions have set up Day Schools at weekends to demonstrate some of the practical and experimental work in the course and to give students an opportunity to visit science laboratories. These Day Schools are very popular and many students who attended them stated they would prefer to do all their hands-on work in these sessions. The average low hire cost of a college laboratory with a technician and the cost of tutor time for one day could make Day Schools an attractive option for the university.

Some students stated that a number of weekend Day Schools would be preferable to both the HEK and Summer Schools. Other students and most tutors felt that the intensive nature of Summer Schools could not be replaced by the shorter Day School experience. Typical comments by students who attended a Day School are given below:

"I appreciate the day particularly 'cos it's at the weekend. I can't get to study centres. They only operate at night during the week and I work away from home."

"It's great having tutors to demonstrate experiments, using scientific equipment"

"Why can't we have more Day Schools and cut out Summer School? Summer School eats into my annual leave I have to pay £177 for it and I have to leave home."

"Day Schools are held at the weekend I don't lose out on holidays and one day sessions, more often spread out across the year would be much better than one intensive week at Summer School."

The Day School "has given me an opportunity to work in a lab and prepare me for the summer school."

"I expect Summer School will be a blurred rush of activity Day Schools spaced out through the year reduce intensity but increase my ability to learn..."

It's "difficult to do experiments properly without tutor support."

Some tutors felt that Day Schools reinforce HEK activities, presently done at home. Some tutors saw Day School as replacing certain HEK activities:

"Doing the chemistry - all the preparation and fuss just not worth it... Day School could replace it ... Much better (for the student) to go into a real laboratory, even if they don't use equipment, at least they get to see or get an idea of (the) equipment that is used."

An Open University, Walton Hall member of staff supports the expansion of the Day School role, pointing out the EC experience:

"Wet chemicals (are) not sent across borders essentially just Part 1 of the kit is sent. In place of the chemistry experiments Day Schools in Europe. Day Schools have advantages over working at home using HEK in that they have tutors there, students work together under tutor guidance. HEK..... Doing experiments at home so many things that can go wrong This for complete beginners is a problem. Day Schools are much better."

Another Open University, Walton Hall member of staff points out that:

"40% of S102 students are women..... What puts women off science? HEK is daunting and too big, is one possible reason. The fact of a compulsory summer school with more in future science course options is off-putting for women. They are residential and therefore cause disruptions to the traditional family home."

Could Day Schools alleviate some of these problems by taking the place of Summer Schools?

The researcher believes that activities in Day Schools could replace certain tasks presently carried out at home, using the kit and that Day Schools could replace certain Summer School activities.

INCORPORATING A PC IN DAY SCHOOLS.

On the topic of alternative deliveries, the PC was the most debated. The advantages and potential difficulties arising from including a PC are both considerable. However, there seems to be significant pressure to include a PC in the new course; as one staff member pointed out:

"Can the OU afford not to include a PC in a new science course that will take the Science Faculty into the next century? Many of the skills students now must have in HE involve IT (Information Technology). We will increasingly teach using IT So students have to become familiar with it and they have to use IT.....There is no point doing it unless you introduce it in the foundation course."

This section of the report puts forward the main opinions expressed by the informants and suggests a compromise strategy of incorporating the use of the PC in Day Schools.

If a PC were a compulsory component in the new course, many students would be put off or turned away simply because they would not have access to a PC. The predicted expansion in households owning home computers never happened. The growth has been slow. By 1990 only 20% of households in the UK had PCs and their usage was mainly for games (Jones, Kirkup, and Kirkwood, 1993 p. 63). Typical student views on the inclusion of a PC into the course are:

"If the course had a computer as a compulsory part, I'd not do the course."

"Some people might be put off by the kit. I'd be put off by the PC."

"It's a question of access how many students can get hold of a PC? Not many. And who can afford to buy one? I can't see the OU being able to supply us all with one."

"I'd be happy to use a computer as long as I didn't have to buy one."

"I can't afford a computer ... the course fees are £450, and the Summer School £177 make the course expensive ... add on a computer and ... the camel's back is broken!"

Some students would be happy with the introduction of the PC:

*"A new course in science can't possibly **not** have a computer in it!"*

"I'd be happy with a PC replacing much of the kit. I find it very inconvenient having to get out chemicals and bits and do sample experiments on the kitchen table."

"A good interactive CAL program could well replace much of the kit, especially the chemistry bit."

Lower wage earners and non-professional groups are less likely to be able to afford appropriate PCs. It would appear that the university would have to discourage these students in their choice of course because they did not have or could not afford to own particular items. A tutor pointed out that this would oppose one of the university's (now lapsed) general principles: that any equipment required to complete a course, other than a calculator, had to be supplied by the university. Other tutors pointed out:

"The major question is one of access. (I'm) concerned about passing on yet another cost to the students: the cost of the course, the Summer School and now possibly a computer."

"As an associate counsellor for associate students, I'd like to say something on behalf of these students.....If they are expected to also buy a computer.....they'd be totally put off.....associate students would get no chance of loaning a PC from the University's pool."

The bigger the demand for PCs the less the Open University would be able to support students, both in terms of supplying the hardware and in terms of offering individual technical support. Unless as a Walton Hall staff member pointed out:

"PCs (were) designated to Day Schools and that Day School work actually involves their use."

The Financial Assistance Fund (FAF) was seen as already inadequate. As course costs increase, the lower income earners would be squeezed out, as well as those whose partners, for example, see no justification for investing in a PC for the sole purpose of studying an Open University course.

Those who do not qualify for FAF but cannot afford a PC would also be excluded from the Open University science course. In addition, the introduction of the PC could well attract a different cohort of student: those that are already employed who can afford to buy a PC. A student group that has been identified as the 'yuppie menace' (Jones et al., p. 45). This problem would not arise if the PC was incorporated into Day Schools and students were not required to have access to a PC at home.

The Open University does hold in the warehouse a pool of 4000 PCs for loan to students. However, the Open University has been unable to raise the necessary supplementary funds to purchase more PCs. The pool is now limited to students "who fulfil criteria of particular disadvantage" (Jones et al., p. 46). One student commented:

"Some practicals could be successfully put on a computer. But not all. But there are alternative ways to HEK of physically doing the experiments but I don't like the idea of having much of it on a computer..... (a) problems with OU having the hardware to cope with it (b) I did the MST 204 course

.... which now no longer provides the software but offers the computing component at Summer School. The computer programmes may originally be given to students but after a while, after perhaps 5 years when the hardware starts breaking down, you've still got to start thinking of replacing your hardware, updating your software....."

The PCs are bulky, considerably bigger and heavier than S102 HEK, requiring three large packages to be sent to students.

Students who are presently on courses which require PCs experience some problems setting up and using them. They phone the warehouse technicians who can offer some support, but this is time-consuming and is limited to a nine-to-five day. What do students do after hours, when most will want to use the PC? If more PCs are purchased, more up-to-date PCs, it would mean that there would be several models in the pool, making written instructions, updates to software as well as phone technical support a great deal more difficult. The increase in the PC pool would also mean an increase in technical support staff needed in the warehouse. The actual costs of increasing the pool of PCs and related support staff and services needed would be no doubt more expensive to run than the existing HEK in terms of technical support, maintaining, checking and mailing, etc.

There would also be problems in terms of turnaround time in the warehouse. With present courses where PCs are required, students do not have to return them until the end of November and the same PCs need to be checked, re-packed and sent out again for the new course students in February. If there was an increase in the pool, the current turnaround time could prove to be difficult to maintain.

If a PC were included in the new course, there would be a danger that it would drive the rationale of the course. An Open University, Walton Hall member of staff pointed out:

"Once a computer is included, it might drive the rationale of the course. The media you invest in you want to make the most of it and therefore you need to be careful it doesn't lead the thinking on what should be on the course curriculum."

A student commented:

"I'm also doing the Technology course ... which is really good and uses the computer well ... is the computer really so important in a general foundation science course?"

In order to justify the heavy investment to the students and to the Open University itself the course developers would be forced to use the PC as much as possible. Ultimately, this could change the focus of a foundation course in science. As one tutor noted, it could change from offering a basic course to something much more sophisticated and would inevitably lead to students being:

"forced to do experimental work through a glass screen" (and quite literally) "through a black box: the student feeds in the information, the PC does the work and gives out the results, the student is none the wiser." Yet in the "real world of science much of the basic laboratory work still uses test tubes, pipettes and similar contraptions of science." (Thus) "experiments through a PC are a poor substitute."

And although "our scientific knowledge... is constantly being challenged and modified" (S102, Introduction & Study Guide 1987, p. 3), the basics of science remain unchanged. S102 and its component parts including HEK is, according to the Science Faculty Board:

"for all its faults, a powerful teaching vehicle, and that although the outside world is changing, the foundation study necessary to pursue science is not." (1993, June)

HEK may well be daunting, especially to those new to science and perhaps to female students, however, as one tutor put it:

"the introduction of the PC is potentially more traumatic and certainly far more time consuming than the present HEK itself."

Many students, especially those who are computer illiterate would need to devote considerable time just coming to terms with the PC and to acquire basic IT skills. As two Walton Hall members of staff stated:

"The introduction of the PC will dramatically increase students' workload."

"Can you teach an adequate amount of science and IT skills and include a substantive amount of home experimental work within a single foundation course? I doubt it."

Others who are accustomed to computers but have access to, for example, Apple Macs rather than DOS PCs may well find themselves excluded from the new science course.

"I've got an Apple Mac ... I won't want to use or buy another computer".

"The OU is too inflexible with its computing requirements."

Yet the potential advantages of the PC for the foundation course are considerable. Some of the benefits of computers in education are described by Jones et al. (1993, p. 5) and are summarised below. These benefits could well be relevant to the new science course and include:

- individualised learning through drill and practice exercises.
- tutorial support: offering questions to be answered by students with immediate feedback and with further explanations on the topic.
- simulation programs that offer students experiences they would not normally get. For example, "the changing ecology of a pond and its inhabitants" where the user changes "values of variables" and the computer displays the resulting effect. Usually in simulations, the student is more than the observer and is invited to take part in the role of the experimenter or scientist, investigating the result of making changes to particular variables (Jones et al., 1993 p. 5).
- the computer as a study tool. The computer, alongside the student doing practical and experimental work, can be used to record or capture data, as a visualisation and analysis device and to do more complex calculations, freeing the student to use their practical and experimental time more effectively.

It is important to note that an increasing amount of high school science teaching uses computer driven devices and future students coming into the Open University may well be accustomed to this use of computers.

- the use of the computer for electronic mail, for computer conferencing and other forms of computer mediated communication. Students would have faster and easier access to their tutors and fellow students. Their assessment turnaround time would be reduced, giving them quicker feedback on their work. Students would be able to ask tutors questions to help solve difficulties or problems they encounter during the course and they would be able to send and read messages at a time most suited to themselves.

One student noted:

"I was involved with a computer conferencing experiment. (at the OU).... it turned out to be very expensive for me. E_mail and bulletin boards are good for access to information and are relatively cheap."

Of course, it is not suggested that the PC should replace practical and hands-on work, but that through its use at Day School, alongside for example hands-on work done at home using student supplied materials, HEK in its present form would no longer be needed.

There is no question that the role of Information Technology in science education is increasing and as several Walton Hall members of staff stated:

"If the OU is to retain a reputation as an educational innovator, it surely has to incorporate PCs into the new course."

"Is it feasible in the year 2000 and beyond to be telling people they will get a university education (with the OU) that actually does not train them in IT skills ... My feeling increasingly is ... that answer is no."

"Increasingly, IT like home experiments and summer school has been ... will be essential ... for a course to gain recognition from outside. cut your losses with home kits and do what you can with IT."

It should play a major role in the new course "but (it) does not mean (that) every student must have (a PC) at home".

Conventional universities are also having to rethink how they offer practical and experimental work and increasingly, they are looking towards PCs to maintain quality and efficiency of practical and experimental work.

A major concern for the introduction of the PC is the question of access.

"The bigger the demand for PCs on courses the less the OU will be able to support students."

"At present, people are slow in buying computers. Far slower than say the uptake of VCRs and audio visual cassette recorders. there's still a wealth of potential students who don't see computers as an integral part of their home furniture."

The question of access was asked by the Technology Faculty before it decided to include a PC in its foundation course. Feedback concerning the PC and its use from some S102 students who are also studying T102 is favourable. It was also stated by a few staff that there are indications that Open University students have greater access to PCs than the national average of 20% of households. As one Walton Hall member of staff stated:

(Our students are not representative of the general UK population) "something over 50% of our current students have access" to (PCs).

The Open University will however need to consider a variety of strategies to ensure that potential students who do not have access to PCs do get access. A possible compromise would be to introduce PC activities during Day Schools and offer further computer resources in the study centres.

END NOTE

This paper aimed to present a broad spectrum of views on each delivery strategy recommended. As stated in the introduction, it is the researcher's belief that an amalgamation of some of these strategies could satisfactorily replace the HEK in its current form.

Obviously, the ultimate goals of the new course need to be finalised before decisions can be made about what role (if any) a HEK should play.

Decisions on possible collaboration of shared materials between the Open University's foundation courses of Mathematics, Technology and Science and outcomes regarding the new course being split into two halves, with various credit options, will all impact on decisions about the role of a HEK.

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ISSUES AFFECTING THE SUCCESSFUL PILOTING OF A COMPUTER MEDIATED COMMUNICATION SYSTEM (CMCS) FOR GRADUATE USE.

ABSTRACT

A Curtin University pilot based on the acquisition, utilisation, and evaluation of a commercial CMCS LOTUS NOTES in the higher education context in 1993, has identified a number of issues which impact student learning. These issues can be categorised in three divisions:

- * technical*
- * logistical*
- * pedagogical*

A commercial CMCS was selected for easier development and implementation.

The CMCS was used in a unit as an option to provide a student centred approach to learning and though the volume of messaging was limited in this trial, future programmes could better this. Students were required to prepare a weekly summary for peer review.

This project entailed the obtaining of a server computer, four modems, and the installation of a suitable communication card. Training, installation help, and technical support were provided over twelve months and the time required for this activity should not be underestimated. Joint department cooperation limited the logistical difficulties faced.

A number of technical difficulties related to the OS/2 system, LOTUS NOTES, and the various modems available were overcome. Two different operating systems were tried: OS/2 and MSDOS. One major technical advantage when providing technical support is that the interface and mode of user operation are identical.

INTRODUCTION

Telecommunication systems are becoming an important part of professional life for many occupations. This is especially true for business students studying at Curtin University. The importance of telecommunications can be viewed from many perspectives; student access to telecommunications, remote group skills and exposure to student-centred learning approaches to name a few. Each of these possible perspectives will be considered in the background section following.

The search for a CMCS for the Curtin Business School started in 1992. It was decided that the CMCS would have to support electronic mail (E-Mail), an electronic bulletin board and computer conferencing (CC). An evaluation copy of EIES 2 (Electronic Information Exchange System) providing these capabilities was obtained and installed on a Sun minicomputer. Shortly after, the

accepted. However, the text-based interface used by EIES 2 was not considered suitable for graduate courses. Therefore, a graphical user interface (GUI) system supported by a major software house was sought. Additional criteria set for the CMCS, were that it should be capable of connecting to the other major systems in use at Curtin University and have an administrative capability for managing group activities. The overriding requirement in using the chosen CMCS was to complement a pedagogical model based on the goal of achieving improved student centred, independent learning through group interaction (Fjuk, 1993). Experience todate indicates that LOTUS NOTES has the potential to meet these needs whilst providing considerable flexibility for the future.

A commercial CMCS was ultimately selected for easier development and implementation. For this pilot, a set of default template databases was used to limit the potential problems resulting from a lack of familiarity with the development tools. A unit with a theoretical and philosophical orientation which could make use of the computer conferencing capability for reflection and discussion was chosen. E-mail and an electronic bulletin board were also in use for personal communication and course administration respectively. The small number of graduate students involved in the pilot turned out to be an advantage. This was due to the telephone lines and multiple modems not being in place until several weeks into the semester.

It is anticipated that future courses will make use of the more advanced group application development features and group writing capabilities within the system. As an experimental CMCS, an ideal environment is provided to test the effect of structure on communication patterns in learning behaviour. It is also expected that students and staff in a variety of courses will be given the opportunity of using the CMCS in the near future.

BACKGROUND AND THE RELATIONSHIP WITH OTHER CMC STUDIES.

The feasibility of using CMCS with the new hardware and software capabilities make possible many new opportunities for institutions and organisations. The chosen CMCS provides one such opportunity in higher education.

A precise definition for CMCS is difficult to provide because of the range of capabilities and overlapping uses. As a result, a very wide definition will be used and the different forms of communications detailed.

A CMCS provides a communication medium which allows participants to exchange ideas and information with other users, regardless of the time of day or the distance between the users. (Tooey and Wester (1989:55))

E-Mail provides a person to person, or person to group messaging system. Messages have to be manually separated into topics because they arrive chronologically. For some participants reading a large number of messages sequentially can be disorienting. Distribution lists distribute messages to the subscribers as they are processed.

In this pilot, students used this form to exchange personal messages and arrange social meetings (e.g. squash game).

Electronic Bulletin Boards Systems (BBS) provide a person to person, or person to group , or group to person messaging system which stores messages under topics. All public messages are available for a set time so that late comers can catch up on discussions. BBS appear to have a unique following of loyal users who form an "electronic social centre". Software distribution is

unique following of loyal users who form an "electronic social centre". Software distribution is given a high priority on the many commercial and non-commercial BBS. Information and software is available without the need for sophisticated software. One such global system is the NEWSNET facility.

This form was used to provide administrative notices, detail university software piracy policy, and collect the unit assignments. A social centre using the BBS form was implemented but was not used as often as expected.

Computer Conferencing (CC) provides group to group communication. Messages are arranged in a related hierarchy: topic messages and responses are displayed next to each other and flagged as read or unread for each participant. The messages are retained for longer periods than with BBS as well as providing advanced searching capabilities.

The CC form was used to promote group discussions and allowed students to learn in an informal but stimulating environment. Relating readings to personal experiences was encouraged and provided an opportunity for the students to voice their concerns.

All of the above activities were carried out in an asynchronous mode. Asynchronous communication may be defined as a transmission or communication process that does not require both sender and recipient to be on-line at the same time (Rawson, 1990).

This pilot and future work is based upon the premise that " ... the technology opens up and stimulates new ways of working and thinking." (Sproull and Kiesler, 1991).

The CMCS used in this project at Curtin University is primarily intended to provide exposure to a commercial system for graduate students and therefore differs from the other CMCS projects in place through Australia.

Although we provided an E-Mail and BBS capability, it was for specific purposes and could not be used by anyone outside the project due to security safeguards and need to obtain the appropriate software. The work done by Roger Atkinson (1988, 1989) at Murdoch University with low cost and publicly available CMCS will, we feel be used by the wider undergraduate population. Graduate business students appreciate the need for exposure to a commercial CMCS and currently LOTUS NOTES is the leader in business uses. With falling costs, we expect the numbers of students participating to increase.

The *Virtual Campus* concept being implemented at Edith Cowan (Doust, 1993) will provide for a greater range of general student needs as well as catering for overseas students. Although we intend to make greater use of the dial-in library access, extension to other administrative matters is not seen as part of the project. These areas are being considered at Curtin University but are being dealt with separately. As costs fall and technology improves, many new uses for technology will be considered by others.

Unlike Monash University (Harris, 1993) and Deakin University (Thompson, 1993), here at Curtin University we have opted to use a commercial CMCS for easier development and implementation. This is partly due to the experiences in North America (Hiltz and Turoff, 1982) and the United Kingdom (Kaye, 1992a) which required considerable human and financial resources to get the system to the stage of running successfully in unit of study. At Curtin University, we were constrained by limited resources and were fortunate to receive support from Lotus Development Pty Ltd.

The long term intention of this project is to concentrate on the beneficial uses in graduate education to which CMC interaction can be put. This will involve considerable commitment which may take several years to achieve. The time saved on system development will allow us to concentrate on discovering further pedagogical uses for the future. Role playing, student centred learning, and peer review are just some of the exciting opportunities available with this form of CMC.

ISSUES

The issues confronted during this project will be considered in three categories.

a) Technical

The implementation of the eventual CMCS (see figure 1) was the result of considerable technical planning work involving discussions and funding requests. The lack of experience by those involved in using, installing and implementing the CMCS presented many practical and psychological difficulties that were overcome. Fortunately, the initial request to trial, benefited greatly from the support of three "champions": Lotus Development Pty Ltd provided the software; Information Systems, and Teaching Learning Group strongly supported the use of a CMC package in education. Convincing others of the potential of CMC was one psychological difficulty (Castro, 1987 cited in Waggoner, 1992) that was overcome by liaison between the respective departments. Much has been learned through reading of the relevant literature (e.g. Kaye, 1992b; Harasim, 1990; Mason and Kaye, 1990) and by carrying out small trials involving staff members and using "null modems". Experience teaches that a great deal of patience and a creative approach is needed to set up a CMCS.

The CMCS software loaded without problem and has been very reliable since. This is mainly due to Lotus Development Pty Ltd providing places for several staff members on their System Administrators Course. The practical problems that were encountered related to the server operating system (OS/2) and obtaining suitable hardware for the modem connection. OS/2 is needed because of the client-server relationship used with this package. Without access to IBM OS/2 support and an OS/2 list, specific advice on modems and installing multiple ports would have been made more difficult. In addition, over a twelve month period, three versions of OS/2 were installed and used with the CMCS. Furthermore, during this period, an upgrade to the CMCS became available.

Currently, the CMCS is running in three environment: OS/2, MSDOS Windows, and the Apple OS environment. Fortunately, the interface is identical in each of the operating environment which means that support is simplified. The system set-up provides four lines for student use linked to 2400 BAUD modems. Acquiring an appropriately priced computer communication card was made difficult by the limited knowledge of local distributors with the OS/2 system. During this trial, the price of modems has dropped. Acquiring a modem no longer represents a major financial burden, with a reasonable priced external modem costing less than \$300. In addition, students using a modem can now apply for access to library electronic facilities. Future CMC courses will offer this access to participating students as standard procedure.

Many of the initial practical difficulties have been overcome but it is expected that the next challenge will be to link into the University network. The CMCS chosen is currently being linked to many networks throughout the world and it is hoped that this experience will be of benefit. A preliminary investigation into the time and costs involved suggests that the problems of networking

to the range of systems in use should not be underestimated. Currently, long term plans for the use of a CMCS are being drawn up by the University Computing Centre.

b) Logistical

The logistical considerations in working with a CMCS provided further challenges. The main limitation faced was the shortage of manpower to control and monitor activities. The bulk of the work in managing the CMCS occurred during the early months of the pilot study while establishing accounts, installing the client software and training the participants. The NOTES System Administrator travelled to a student's home, business premises, and provided a weekend installation session. Full trouble-shooting support was provided for the participants in addition to the use of a support conference "Help Desk". ASPEN voice messaging and the FAX system were used as back-up for reporting faults when storm damage caused a power cut to the server. The system administration, training, and support were provided by one person and would represent a full-time job if larger numbers of participants were involved.

Limited and unreliable, access by dial-in connections have been a source of dissatisfaction by users (Hiltz and Turoff, 1978). To obtain information regarding line demand, a questionnaire requesting likely access times was prepared and sent out. The replies revealed that at most three users would connect at one time (Tuesday, 6 pm to 8 pm). For this reason, a multiboard modem pool installation was used with four new lines. External lines were needed because of the data noise experienced when using internal lines on campus. A single "group hunt" phone number was thought to be more manageable for the participants but this facility required the use of a standard fixed speed setting (2400 BAUD). Ideally, as the price of modems drops, 9600 BAUD modems will become more common and this will greatly improve access performance.

During the pilot, the participants requested a change of operation to allow a copy of all the messages to be replicated to their local computer. This feature provides a means of working remotely without the delays involved in reading or composing messages and using a phone line for long periods of time. Another advantage is that server modems are in use for shorter periods. By the end of the semester, the student connect time per session was thirty minutes and they connected on average three times a week. To put the connect time in perspective, approximately 80% of connections were less than or equal to 30 minutes with one connection lasting 150 minutes. Connect time represents the time needed to send and receive updates between the client and the server. All the participants made use of this option and set the replication to work in the background whilst continuing to prepare their messages. The replication process can also operate at a preset time and continue until a connection and update is obtained. As a consequence of the improved flexibility of use, the statistics relating to frequency and duration of access may not be comparable with other studies.

A separately linked staff NOTES server provides added benefits. The overall installation is scheduled to ensure that replicate copies of student databases are synchronized between the servers. The staff server is for teaching staff and provides a high speed connection. Security and confidentiality of the staff databases can be better managed when they are physically remote from the student server. Should one of the systems fail, it would be a relatively simple matter to switch to the other server and continue. Planning for disaster recovery is often over looked in reported CMCS uses.

c) Pedagogical

This pilot study went through a number of changes in the pedagogical approach used, largely at the prompting of the students. Students enrolled in the evening class for the unit chosen were given the option of using the CMCS subject to having access to the technology: the technology comprised a computer running MSDOS and Windows, a modem and telephone line. Half of the eighteen students enrolled expressed interest but did not have access to a modem. Future funding will be sought to remedy this situation for disadvantaged students. Out of the eighteen students contacted, five wanted to use the package and had the necessary technology. Four students completed the unit successfully.

One student in particular completed the unit despite the extensive travelling required by his job. He was able to make use of his laptop computer and modem. This type of flexibility is needed by many mature professional graduate students.

A similar course content to the evening class was used for the CMC pilot but the orientation was towards learning in small groups using peer assessment where possible. The unit was originally set up to make use of a group role playing approach (Paulsen, 1993) which was thought to be useful for business students with specific conference databases established for internal group discussions. It was anticipated that participants would experience a range of differing CMC responsibilities: leadership, reporting, and supporting roles within a small team setting. The unit lecturer was available throughout the semester and the students were given the option of attending the evening class at any time if they felt that they needed to. The similar course content made the pilot more manageable for the lecturer concerned.

The original CMC course described above, was designed for two groups of four students but, since only four students had the requisite equipment, some changes were made. The students asked to work separately and to submit weekly reports on the readings to the group. Peer review through discussion was requested by the students because of the size of the group. At the start of the unit the reading list was quite intensive which resulted in point form reports. Assessment was on the weekly contributions and prepared assignment discussions. This worked reasonably well but caused considerable work for the lecturer in terms of the time required to respond to the many issues raised. This approach also led to a weekly monologue by each participant and a disappointing lack of collaboration on the issues raised in the readings. However, two of the participants requested the use of the software for another unit, in order to prepare a collaborative management report. This was prepared successfully by the students in an adjunct mode (McConnell, 1990): attending evening classes, meeting in person, and corresponding via the CMCS.

All the participants indicated appreciation of the flexibility of learning by this method but felt that more interaction with staff was needed. It could be argued that if we had achieved a "critical mass" of participants, more interaction between individuals would have occurred and potentially more collaboration would have been possible. Unfortunately "critical mass" is a concept which appears to depend more on the context than on the numbers. The small number of students made the pilot more manageable. Some of the students involved in the pilot have asked to be advised of future units run using this CMCS.

One final issue that must be addressed is in relation to the liaison of the system administrator and the lecturer. Staff need to support each other in these roles and ensure that the students know exactly what they have to do as part of the unit assessment. Problems can arise when any party is unsure of his respective role and does not adequately liaise with the others.

CONCLUSION

Curtin University has various non-text based CMCS (e.g. Video conferencing and audio system) but needed a CMCS offering GUI capabilities to supplement its future role in providing professional education. This paper has documented some of the experiences from a limited trial during 1993. Its relative success, has ensured that further units will be run and evaluated over the next twelve months. This trial has also provided a means for two departments at Curtin University to work together in improving access, student centred learning, and making use of alternative methods of "effective" teaching within current structures.

The student centred approach can be seen in the requests made for change in course orientation and the self-motivation evidenced in their weekly reports. The participants were encouraged to relate the subject content to personal work experiences and to prepare points of view that were logically derived. Assessment was made by the lecturer on all contributions and prepared assignment discussions. Although a small number of students as involved, and no significant conclusion can be drawn, the lecturer did feel that the overall student performance was very good. This was surprising since it was expected that they would have some difficulty with the technology. The fact that the students have asked to be involved in future units run using this CMCS suggests that they appreciated this alternative learning environment. During the year, several members of staff have been impressed by the flexibility of teaching possible and are considering using CMC in future units. Once established, we expect that these forms of CMC will be used in many different ways (Paulsen, 1993). In addition, as this environment becomes more established, it is hoped that funds will be made available to support further development.

This pilot programme succeeded in meeting its goal of providing evidence that it could feasibly be used for teaching and learning in a graduate environment. It proved the reliability of the system and relative ease of use by all concerned. However, the pilot study would not have been possible without the contribution of the three "champions". The result suggests that LOTUS NOTES has many benefits for the development and implementation of CMCS into professional higher education. The students involved in this pilot consider the experience to have been valuable for their respective careers.

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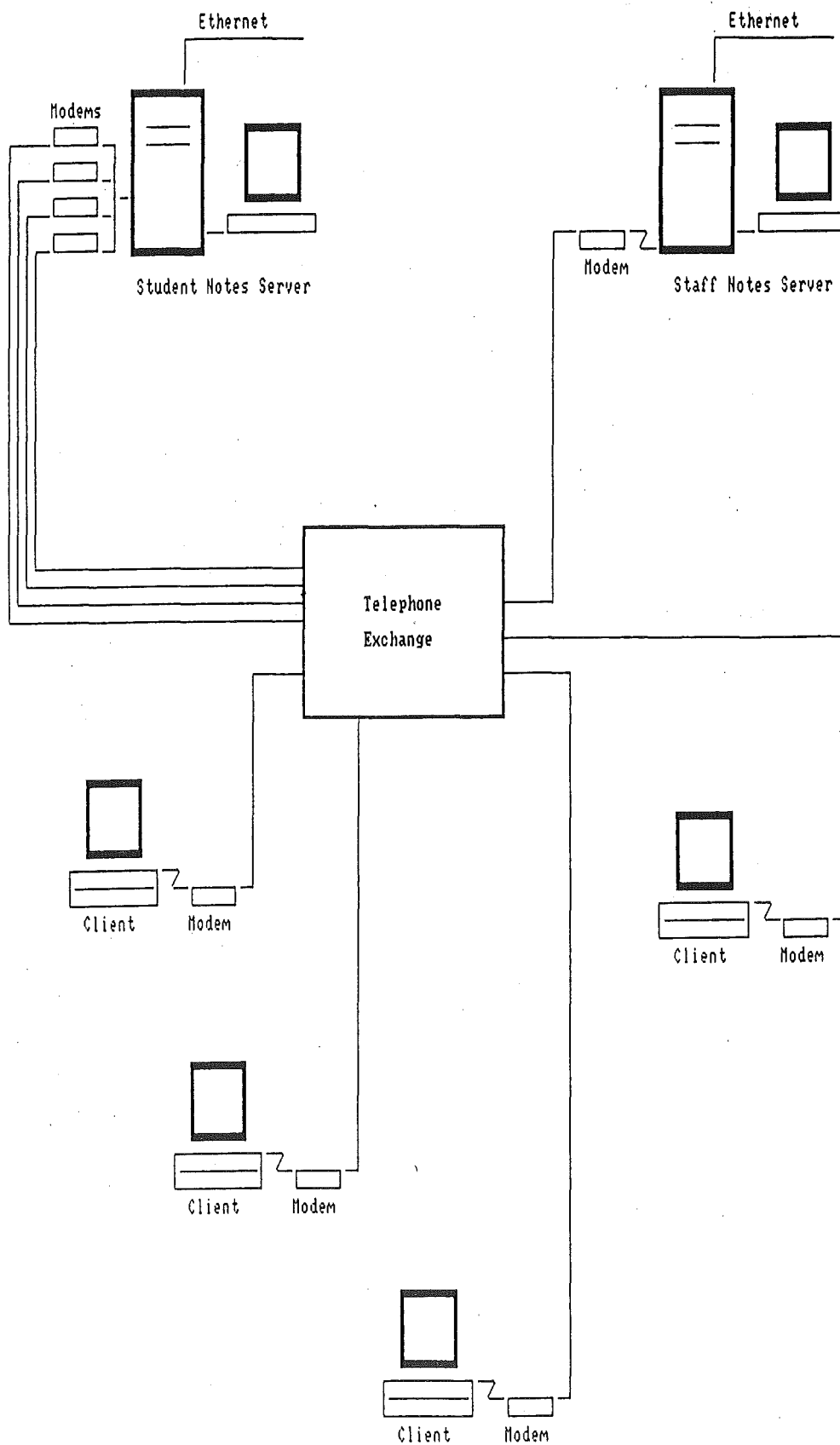
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The resources provided for this pilot, come from the active support of Information Systems and the Teaching Learning Group (T.L.G.). Both bodies have provided infrastructure, technology, manpower, and financing through a WADEC grant.

Figure 1: Lotus Notes Installation



STUDENTS' PERCEPTIONS AND QUALITY TEACHING

Small boy (to friend, patting dog)

I've taught Rover to whistle.

Friend (Sceptically, listening to dog.)

Oh yeah? I can't hear him whistling.

Small boy

I didn't say he'd learnt - I said I'd taught him.

AN EVER-PRESENT PROBLEM

As far back as the records go, writers on education have been stressing that good teaching is concerned with reaching the whole person, with engaging the mind. To quote three examples taken at random from the shelves of the library:

A second corollary from foregoing general principle, and one which cannot be too strenuously insisted on, is that in education the process of self-development should be encouraged to the uttermost. Children should be led to make their own investigations, and to draw their own inferences. They should be told as little as possible and induced to discover as much as possible. Humanity has progressed solely by self-instruction; and to achieve the best results each mind must progress somewhat after the same fashion.

(Herbert Spencer)

The purpose [of education] is not to make men learned but to make them wise, to give them an understanding of their own ends of the end of all things.

(Comenius)

The important point, in short, is not to cram the child by force into a rigid framework of studies, but to adapt the framework to the stage of his intellectual development.

(Quintilian)

This sort of claim, which is repeated in endless variations throughout the history of educational thought, is pretty unexceptionable to us. We are believers; we agree, with the devout inattention of the catechumen. Conferences like the present one are for such as us, who already agree with the sentiments, and merely want to find out how to realise them better in practice. Learning and teaching for us involve the whole person; they must excite, engage, challenge, and expand the mind of both learner and teacher.

But think for a moment of the actuality. For every quote from wise educationists we can find another describing a very different reality. For example:

There were students who would work adequately, but not on their own. They fulfilled the course requirements, but wanted to be "spoonfed". They were absolute conformists and regarded the course as an object to be placed whole in their notebooks. The irony was that those lecturers who deplored this approach admitted that, nevertheless, their course structures and assessment procedures did not prevent students from adopting it.

(Entwistle & Percy, 1974)

This too, is entirely familiar; distressingly so. We are all of us surrounded by a huge majority of students and colleagues for whom it is as if the several preceding millenia of educational thinking had never been. Our universities are peopled by would-be learners and teachers for whom education is about nothing like "engaging the mind". For them it is about getting and giving information; telling the facts; transferring data from brain to brain- however you want to describe it. Or it is acquiring mental skills, or, worst of all, it is about playing institutional games so as to attain the institutional rewards.

And, in case you think I am overlooking my own institution in this, let me give you some extracts from a brief survey of just over 50 students in one of my classes at the start of semester a couple of years ago. It illustrates the point very well. I select from the questionnaire a few statements with which none of the class should have had the slightest hesitation in disagreeing. The reality was otherwise:

As a student my job is to keep the lecturers happy and complete the work they give me. They reward me with marks. 1 in 3 disagreed

When I read a text I try to transfer, as accurately as possible, what is on each page in to my memory. 1 in 3 disagreed

I think that the best way for me to learn new things is to go over and over them until they are fixed in my head. 1 in 5 disagreed

The best way to get good marks in an essay is to write down all I know about that particular topic. 1 in 6 disagreed

The best way to get good marks in assignments is to find out what the lecturer wants and write those things. 1 in 8 agreed

My job as a student is to know the correct answers. 1 in 8 disagreed

I worry that, if I pick out important parts from what I'm reading, and don't read everything, I might miss something. 1 in 14 disagreed

A PUZZLE

Why should there be such a striking and self-perpetuating mismatch between the ideal and the actual? I find the question genuinely puzzling. Could it be simply another sign of human frailty, the inability fully to realise our ideals in any endeavour? That would be a reasonable supposition if most students and staff, for most of the time, were aiming for the goal of real, mind-expanding learning and simply not attaining it very often. The problem is, not that they don't reach the goal, but that they don't even think of aiming.

Yet it is not as if actual practice were somehow more satisfying, or even easier, than the ideal. We cannot use the excuse of the backslider: that heaven is a long way off and, here on earth, indulgence is undeniably more fun than self-denial. It is simply not true that the seductions of the information-transfer approach outweigh the long-term benefits of real teaching. Teaching which is attempting merely to transfer information from teacher to student is a heavy and unrewarding slog for both parties. The evanescent occasion, when the "information" challenges or fascinates the student and excites the mind, is rare.

In sum: all thoughtful writers on education for millennia have urged teachers to strive to engage the learner; by and large they fail to do so. The way in which they do teach is pretty unrewarding for both teachers and students. This presents us of the minority with an extraordinary and a most puzzling irony.

AN APPROACH TO THE PUZZLE

As with all educational issues, there is no simple or single way to resolve this puzzle. It will always be a puzzle, and I value learning too much to want to "tell you the solution", even if I knew one. I can, nonetheless, pose the problem in such a way that you may set about answering it for yourselves. I shall, in other words, not answer the problem but suggest a way of answering.

My approach to the problem draws on my background in communication studies. You are all familiar with the elementary and indeed simplistic model of communication:

EXPRESSION ↔ MESSAGE ↔ INTERPRETATION

(I avoid using the more common terms "sender", "information", "receiver" because they are part of the problem, for reasons which I hope will become obvious.)

Now, the crucial aspect of any communication act is the interpretation. If a person wants to communicate, and expresses a message, if there is no-one to interpret, or if the interpretation is impossible for some reason, no communication occurs. Similarly, the very nature and content of the message depends, not upon the expression, but on the interpretation. Whatever the interpretation is, that is what the message becomes. "The intention to mean something", which is often described as the first principle of communication, is not necessarily relevant. Even when no communication is intended, if a person's actions or words are interpreted by another to mean something, communication has taken place. For example, if a student sitting in a lecture keeps yawning, the lecturer may interpret it as a deliberate message about how boring the lecture is, and act accordingly: by asking the student to leave, say, or trying to be more entertaining, or mentally noting the student down for failure. And this communication occurs even though the student was so enthralled by the topic that he or she was postponing a long-overdue sleep so as to be at the lecture.

My work with operational communication for agencies such as the police and emergency services has led us increasingly to concentrate on the interpretation of messages as the way to avoid miscommunication. Rather than think about what is the best way speak clearly and unambiguously - in other words, about the expression - it is far more effective to think about the listening, the interpretation. In the highly focussed world of operational communication, where failure is fraught with dire consequences, "How is my message open to misinterpretation?" becomes the guiding question.

Teaching is unarguably a form of communication. We can therefore recast the model to represent (equally simplistically) the process of teaching:

1. PRESENTATION ↔ 2. CONTENT/CURRICULUM ↔ 3. LEARNING/STUDYING

EXPRESSION

MESSAGE

INTERPRETATION

(The difference between content and curriculum and learning and studying are not important here.)

To return to our puzzle: it is helpful to describe various views of teaching, by describing priorities in focussing on quality. There are six possible ways in which elements can be arranged in order of priority:

- A $1 > 2 > 3$
- B $1 > 3 > 2$
- C $2 > 1 > 3$
- D $2 > 3 > 1$
- E $3 > 1 > 2$
- F $3 > 2 > 1$

Probably all of these priorities can be found in practice, although some are more common than others.

View "A", for example, is frequently met with; it could be expressed as:

I focus first on presentation (1).
Then, provided the content (2) is reasonable,
quality learning (3) will follow.

Those academic staff developers who see their job as principally advising on teaching methods and secondarily on curriculum design hold to this order of priorities. Another common view is C:

I focus on content (2) (sound, well-researched, graded in difficulty & c).
Then, provided my presentation (1) is reasonable,
quality learning (3) will follow.

The stereotype of the traditional university lecturer is represented by D:

I focus on content (2) (sound, well-researched, graded in difficulty & c).
Then, provided the students are capable of learning (3) (i.e., admit only good quality students to the class),
My manner of presentation does not matter. ("I'm not here to spoonfeed them"; "If they're incapable of learning, it's irrelevant how I teach.")

There is a widely encountered argument that can be stated as "I've taught them a really good course, but they haven't learned it, so they must be unintelligent". It is a version of the D approach.

These descriptions, of course, refer to priorities and emphases, not to discrete, clear-cut approaches to teaching. For example, it is unlikely that even among the very worst lecturers there are many who regard their manner of presentation as *entirely* irrelevant.

The ideas expressed by Spencer, Comenius, and innumerable other writers (and, of course, espoused by us) can be represented as E:

I focus on learning (3) (the "engaged mind").
Then, provided my presentation (1) is reasonably sound,
The content (relatively speaking) does not matter.

And this is where one way of solving our puzzle starts to emerge, for this is a very difficult order of priorities to have. There is a mismatch between excellent sentiments and actuality because, although we would love to be able to translate this view into our practice, it is very hard to do. Every other order of priorities is easier to maintain. This one is demanding; this one threatens our control of what happens in our classes. For, no matter how much we like to think we are "getting the message across" and ensuring that our students really "take it in", they are interpreting what we say. They are creating their own messages. The paradox is that the more we succeed in engaging the mind, the more interpreting that mind will be doing, and the less control we will have over what is learned, and how.

A DIFFICULT TASK

Despite our assent to the views of education canvassed at the beginning of this paper, we do not realise just how very difficult they actually are. We can be very good at devising subtle means of hiding from ourselves the fact that we have not, deep down, really espoused them at all. I have begun to collect the excuses we lecturers give to one another to justify the way we teach. In the past few months I have jotted down the following:

I've tried the student-centred approach in my classes, and they don't like it.

I'd like to take this approach, but you can't do it with more than 200 in a lecture.

I agree in principle for some subjects, but in my subject there are certain basic facts they just have to know.

You just can't afford to do it when you have so much material to cover in the curriculum.

Despite their superficial relevance, these comments really miss the point. Lecturers who make them have not, I venture to say, grasped what it means to focus on learning. The first two, when you consider them closely, are actually about approaches to presentation: (1) in our model. Let us look at the first objection. Although he used the "correct" - sounding term *student-centred*, this lecturer (incidentally from the School of Education) was in fact talking about such things as the arrangement of seats in the room and where the teacher stands, the amount of individual responsibility given to students, the sorts of questions asked, who dominates the talk. These are important issues, but they are matters of presentation, not interpretation.

The second objection amounts to a claim that it is impossible to teach 200 students well: "I have a lecture theatre full of students, therefore I shall have to teach them badly." It does not stand up to close examination, and it has nothing to do with the aim of focussing on interpretation. When there are 200 in a lecture theatre, what is precluded is not good teaching *per se*. It is personal interaction and individual attention. We can still think about how to lecture most effectively, by starting to focus on interpretation. There are good lectures and bad ones, just as there are good small groups and bad ones. The good ones, whether lectures or tutorials, whether there are 10 students or 100, engage the mind. Paradoxically, lectures are in many ways an ideal medium for allowing the listener the freedom to interpret. Because the teacher is not relating intensely and constantly with individuals, there is less attempt by the teacher to control what is learned, and how. The student can actually be freer to engage in creative interpretation in a lecture than in a small group.

A FINAL OBSERVATION

The difficulty of taking the interpretation - learning end of the process as the focus and basis of our approach to teaching is that it requires the teacher to relinquish control over what the students learn. Or, to be more accurate, it asks the teacher to recognise that he or she has very little control. But this is always the case, anyway. We have all experienced the paradox, as part of the audience of a lecture, that the most inspiring lectures, those from which the student learns most, are often those in which the student's mind goes off at a tangent to the lecturer's content. The mind is set off on a train by some item or another in the talk - and not necessarily an item that the *speaker* thinks is particularly important. The listener begins speculating, building a network out of the new ideas; questions start pressing themselves on the learner's attention.

(As an interesting example of what I mean, after I had delivered this paper at the conference in Perth, a colleague congratulated me on one of my points that had, he said, really set him thinking. I suppose it is not surprising to note that I had no recollection of having made this point at all. Obviously something I said had triggered off a process in his mind that ended in his learning something that I had not specifically intended to teach.)

This is what happens when the mind is engaged: it runs at its own pace and wanders wherever it will. I suspect that most of us, whatever we think we believe about learning, are not really willing to let go and let the learner dictate what is learned.

Yet it will inevitably happen, anyway. However hard we try, we can never alter the fact that learning, like all forms of communication, depends in the last resort on the interpretation, and not on the teacher's presentation. Now it is almost certain that this is not what the students perceive. They share with their teachers the view that the primary focus of teaching must be on the presentation. As long as we think about our approach to teaching from the interpretation end, we shall continue to fail to engage their minds.

Here is one way, at least, of answering the question I posed at the beginning.

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DOING DOSAGE CALCULATIONS COMPETENTLY

ABSTRACT

Dosage Calculations in Clinical Nursing Practice - no room for errors! The School of Nursing at Curtin University recognises the importance of safe dosage administration by requiring students to achieve a hundred percent mastery. Traditional instruction and assessment approaches have been problematic. The question was, "how could we improve the situation"? Computer Based Learning offered a possible solution.

The revised version of 'Become an Expert in Dosage Calculations' has now been incorporated into the 1994 Nursing Curriculum following two trial periods. This paper describes the developmental phases involved in making the Computer Based Learning of Dosage Calculations work and briefly considers 'Was it worth making it happen'?

1. INTRODUCTION

An inherent aspect of Clinical Nursing practice is the need to perform dosage calculations. A patient's safety is reliant on the capabilities of the nurse performing dosage calculations prior to dosage administration. The alarming nature of dosage errors has been reported by many, none more clearly than Perlstein et al. (cited in Worrell & Hodson, 1989). They demonstrated that fifty-six percent of registered nurse's drug errors would have resulted in an administration dose ten times greater or less than that prescribed. It is precisely for these reasons that Nursing students at Curtin University are required to demonstrate a hundred percent mastery of dosage calculations.

Previously, the instructional content for dosage calculations had been taught using lecture presentations. The opportunity for practice was available through the use of worksheets. The worksheets provided the student with a range of artificially presented questions.

The doctor prescribes the patient 0.3 mg of Atropine Sulphate. The stock strength is 400 mcg / 1 mL. Calculate the correct dosage.

Assessment is being scheduled at pre-determined times throughout the semester, with the student being offered three attempts to demonstrate competency.

As the teaching and assessment of dosage calculation stands, the demands placed on the lecturer are excessive.

Large group teaching of this sort fails to wholly meet the adult learners' needs. If the andragogical model, proposed by Knowles (1984) is accepted, then the teaching and assessment strategies must be expanded to incorporate experiential techniques, individualised and informative feedback, and relevant instruction, whilst facilitating self-determination of needs and self-direction in practice. All of this should occur in a non-threatening environment.

Within the confines of teaching in the current climate, the logistics and economics of large group teaching can somewhat limit the achievement of more educationally sound teaching and assessment strategies.

A notable element of the problem appears to be what can only be described as 'Maths Anxiety.' The irrational fear of anything to do with mathematics. Students enter the Nursing Course with varying levels of academic achievement in terms of mathematical abilities. Many of the students appear to have forgotten the principles of basic mathematical computations involving addition, subtraction, multiplication and division. Especially so if the use of calculators is excluded.

'Become an Expert in Dosage Calculations' was developed in response to these difficulties.

2. DEVELOPMENTAL PHASES

2.1 Phase One - Needs Assessment

The teaching and assessment strategies previously used were problematic in nature, resulting in:

- An inflexible teaching and assessment matrix.
- Promotion of pedagogical rather than andragogical principles.
- Contextual artificiality.
- Excess demands on staff.

A retrospective study of students' performance in dosage calculation tests for the period 1989 - 1991, indicated the mean percentage of third semester students attaining mastery on the first attempt was 46%. The logistics for further remedial instruction and assessment for the remaining large body of students prevailed.

Together with the issues already discussed, there was no doubt that there must be a better option which would not compromise student learning, but rather, improve the quality of their educational experience and at the same time facilitate learning transfer and subsequently produce a safer practitioner. A tall order, but one that needed to be filled.

2.2 Phase Two - Planning

Preliminary to considering alternative teaching and assessment strategies the curriculum platform was considered. Decker Walker (Beyer & Apple, 1988) coins the term platform in his naturalistic model of curriculum planning, to indicate the set of educational beliefs and values held, in this case by the School of Nursing. The philosophy of the School supports the belief that the student is central to the educational process, being an active learner, with adult learning needs.

Literature support for the role of computers in dosage calculation instruction is well supported (Cartwright, 1987; Reynolds and Pontious, 1986; Thiele, 1986; Wong, 1990; Worrell and Hodson, 1989). The inclusion of computers into the curriculum was certainly congruent with the other platform components.

A review of current market releases supported the development of a program designed to meet Australian needs. Rejection of established products centered on inappropriate content, unrealistic content presentation and technological advances outdating the capabilities of the programs.

2.3 Phase Three - Minifellowship

The Office of Staff Development funded the 'Become an Expert in Dosage Calculations' in their round of 1992 Minifellowships. This scheme provided \$3 300 to get the project underway.

2.31 Team Work

Initially meetings with personnel from the Computing Centre at Curtin University were held to discuss the project's feasibility, instructional design, content preparation and programming requirements. It should be recognised that at this time some of the team members were new to the task. Ultimately the 'core' team involved the content expert and the programmer.

2.32 Content Preparation

The content was determined and four modules established:

- Module One : Drug Dosage Calculations
- Module Two : IVT Dosage Calculations
- Module Three : Clinical Decision Making - A Simulation
- Module Four : Testing facility.

Initially, butcher's paper was used to outline the modules and their respective content. An attempt was also made to establish navigational links / pathways.

The content was prepared by the content expert and presented to the programmer in a screen stack arrangement (a basic storyboard format). The cards indicated the content, sequencing and schematic representation of the screen layout, including graphics.

The entire process was lengthy, requiring many more preparation hours than that required for traditional presentations. Records show preparation hours for the first two modules to be in the order of 110 hours (i.e. ~ 55 hr / 1 hr of courseware). However, this does not reflect the hours spent modifying the content to better suit the technical presentation superiority of this medium. Additional time was spent on attempting to establish an alternative 'tack' in the presentation; one where the content was presented in a non-linear, fully interactive mode.

2.33 Programming

The content was prepared for presentation on an Apple Macintosh platform using Aldus Supercard 1.6 to meet the authoring requirements.

The screen stack, together with graphics (which were either scanned or created using MacDraw, Phototshop and Canvas) were programmed into an interactive media presentation. Programming and graphic preparation time was severely underestimated allowing only a prototype of Module One to be completed. Seventy-five hours were funded for the prototype development.

2.34 Evaluation

A trial of the prototype was carried out on all Semester Three students. An evaluation questionnaire (using Likert scales and open ended questions) was designed, mainly to gather formative data on the instructional design, user interface, content presentation and students' satisfaction with the delivery option.

All students attended a supervised, one hour laboratory session. A prepared 'HELP SHEET' instructed the student to practise the mouse skills of clicking, pointing and dragging demonstrated in the 'Macintosh Basics' program prior to trying the prototype.

At the completion of the hour, each student was asked to complete the questionnaire.

2.35 Results

A complete analysis of results from this trial has been detailed elsewhere (Glaister, 1992). Suffice to say that the prototype was extremely well received, with feedback comments heralding the necessary revisions.

2.4. Phase Four : Caut

'Become an Expert in Dosage Calculations' advanced further with a funding grant of \$5 532 from DEET's Committee for the Advancement of University Teaching.

2.41 Team Work

The request for further financial support acknowledged the need for the expertise of a Graphic designer in the project. Accordingly the team swelled to three, the content expert, programmer and graphic designer.

2.42 Content Preparation

Work continued on the program in first semester of 1993. Graphics and animations were added using Macromind Director.

By second semester 1993 the program was nearing completion. Module Three : Clinical Decision Making - A Simulation had been abandoned, primarily because the content (without the use of a workbook) was not easily represented on the computer and secondarily, money was depleted. Instead, two separate testing facilities (Drug Dosage Testing and Intravenous Therapy Testing) had been developed.

2.43 Programming

Programming time had again exceeded the estimated budget (\$3 820, although \$4 600 was eventually used) primarily because of the nature of some of the changes made following the prototype trial. A particularly time consuming alteration was the addition of individualised, informative feedback to students' calculation responses. Secondly the program was run from a central computer over a classroom network. The software was locked to prevent tampering with (accidental or otherwise). This combination, meant revisions or correction of 'bugs' were initially time consuming and hard to accommodate.

2.44 Program Implementation

The complete program was utilised by all students enrolled in the third semester Nursing Skills unit. A one hour supervised, introductory laboratory session was scheduled. Again 'Macintosh Basics' was recommended prior to using the program.

Students were expected to be self-directed in determining their learning needs and book unsupervised practice laboratory times accordingly.

Once a student deemed self ready, then a test could be attempted. The thirty minute test uses the same format as the testing facility, the only differences being the exclusion of the 'SHOW ME' button and the inclusion of an on-screen timing mechanism. At the completion of the test, the student is provided with immediate computer feedback. The test attempt is stored in an Administration file for later access by the instructor.

2.45 Evaluation

At the end of the semester all students were asked to complete an evaluation questionnaire. On this occasion the evaluation was designed not only to collect formative feedback but also with the following research questions in mind:

1. Is student learning compromised using computerised learning of dosage calculations?
2. What is the relationship between a student's mathematical and computing backgrounds and their performance on a computerised dosage testing facility?
3. Does a student's attitude to computerised learning of dosage calculations influence their performance on a computerised testing facility?
4. Is the length of time a student spends using computerised instructional and practice facilities on dosage calculations a predictor of performance on a computerised testing facility on dosage calculations?
5. To what extent does a student's age and sex influence their performance on a computerised dosage testing facility?

2.46 Results

Results of this trial are still to be analysed.

3. WAS IT WORTH MAKING IT HAPPEN?

The aim of the program was to produce a teaching and assessment strategy for dosage calculations. A strategy that would provide quality of instruction without compromising student learning, whilst at the same time, decreasing demands on staff. Certainly the instructional content has been advanced by the use of graphics and animations. The technology has allowed the student to be more active in the teaching-learning process. Although the program is fully interactive, providing informative and individualised feedback, demands on staff were not greatly reduced in the trial as a result of the programming 'bugs' and errors that required revisions. However, given their correction the potential exists. In terms of it compromising learning, further research is indicated with the revised version of the program. Despite the programming technicalities, 57.5% of students passed their drug test first time compared with a mean percentage first time pass of 51% for the period from 1989 -1992. Likewise the failure rate for the drug test was 0% compared to 1% for the 1989 - 1992 period.

It should be noted that anecdotal evidence supplied by students from the prototype trial in 1992 was very exciting. The complete trial in 1993, was not met with the same 'buzz,' perhaps because of the difficulties imposed by the programming 'bugs' / errors. Only further use will determine if the same degree of enthusiasm can be elicited in subsequent student groups.

The program's development, from the drawing board to its inclusion into the School of Nursing's curriculum, spanned two full years. Within this time frame the extremes of emotions were experienced - sheer frustration to exhilaration!

It was the (naive) intention to complete the program and trial it in 1992. However the realisation soon hit! The literature sure did make the idea sound ideal, but the development time to run time ratios were notably absent, as was the cost per hour of completed courseware. Brown at Ascilite 1991, showed that if Computer Based Training is considered, the development time to run time ratio stands at 217 : 1 and the cost ranges from \$10 000 - \$20 000 per hour of completed courseware (Canale & Wills, 1993). All of which puts the cost-effectiveness of this project (despite some over-runs) into perspective.

A word of warning, the program is only as good as the hardware and facilities. The computers in use (Macintosh II vx) are adequate to meet the speed requirements of this program. However due to other requirements, the computers were forced to use 'virtual memory' which resulted in a speed lag in the execution of commands. The lag subsequently opened a new can of worms! An intent of the program was to facilitate self-directed learning. The Labs in use are open only office hours and during office hours are made available first to the 'owner' department. Both factors may somewhat limit the success of the program.

On a personal note, involvement in the project lifted me to new horizons, to see the possibilities of interactive multimedia as an instructional strategy in the teacher's repertoire.

In summary, In answer to the question, I would tentatively say yes. The project appears to be educationally valid and it is up and running!

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**TEACHING AND LEARNING IN THE BIOLOGICAL SCIENCES
AT A NEW UNIVERSITY: ISSUES AND INNOVATIONS**

ABSTRACT

The study of biological sciences underpins all majors offered in the Departments of Environmental Management and Food Technology at Victoria University of Technology. This paper develops an overview of the university and its students, academic programs in the biological sciences, and the raft of innovative projects and strategies aimed at improving the quality of teaching and learning in the biological sciences.

INTRODUCTION

Victoria University of Technology (VUT) is a new university. It was formed in 1991 by the merger of Western Institute and Footscray Institute of Technology, and now occupies six campuses in the central business district of Melbourne (City), the western suburbs (Footscray and St Albans) and several satellite towns (Werribee, Melton and Sunbury): all within or bordering the so-called Western Metropolitan Region (WMR).

Prior to the advent of VUT, the population of the WMR was greatly underrepresented in higher education. Recognising previous educational disadvantage - and in line with its chartered commitment to access and equity - VUT draws the majority of its students from the WMR and from other groups underrepresented in higher education, with a high proportion of students from households in the lower socioeconomic range and a majority from households where the principal language is not English. In addition, many students are from families with little or no history of participation in higher education and thus come unequipped with a mental model of the university and its expectations. In general terms then, the student body enrolled at VUT is quite non-traditional and challenges we the teachers to develop methods which promote successful outcomes for the students or learners.

The Faculty of Science at VUT includes the Departments of Computing and Mathematics, Chemistry and Biology, Physics, Environmental Management (EM) and Food Technology (FT). EM offers BSc degrees in environmental management and applied biology (environmental biology, renewable resources management) while FT offers food technology, applied biology (biotechnology) and psychology. All majors are underpinned by studies in the biological sciences.

Given a largely non traditional student body, EM and FT teaching staff have tended toward non-traditional methods in order to promote quality teaching and learning. This paper presents an overview of the educational issues and innovations in these departments.

ISSUES

The cogent educational issues facing students and staff in EM and FT include any or all of the following (this list is indicative rather than exhaustive):

- (i) learner-based issues centred on student background, abilities and aims: these include prior learning, maturity (mature-age versus school leaver), gender, ethnicity, and student aims and expectations;
- (ii) teacher-based issues centred on the debates about the nature and intent of the curriculum and on academic standards, expectations and assessment: what design principles are embedded in the curriculum? what expectations are there and why? what assessment methods best promote learning and why? what processes and outcomes indicate that quality teaching is occurring?; and
- (iii) institution-based issues centred on the university's expectations of, and support offered to, teachers and learners: these include the tension between teaching and research and between undergraduate and postgraduate teaching; the number of contact hours (up to 14 hours per week for Level A academics); the sheer volume of development work required to transform greenfields sites into successful campuses; the value placed on quality teaching and learning; and the development and maintenance of appropriate support structures (for example, language support for students from non English speaking backgrounds (NESB)).

In addressing these issues, staff in EM and FT have developed a series of creative responses with the following recurrent themes:

- (i) improving the study skills and confidence of first year students and easing the school-to-university transition;
- (ii) development of skills in communication, critical thinking and cooperation in all students;
- (iii) development of inclusive teaching practices; and
- (iv) designing assessment which promotes understanding.

Projects and strategies to realise these themes are described in the following section. These projects are the collective output of a core group of staff whose mutual support is vital for the maintenance of a philosophy of quality education in EM and FT.

INNOVATIONS

Staff in EM and FT have designed and implemented several innovative strategies and projects to promote quality teaching and learning in the biological sciences (some projects have involved collaboration with staff from the Department of Communication and Languages at this university). Since 1991 more than \$70,000 has been awarded from internal (VUT) and external sources to fund educational development in EM and FT. Some examples of innovative strategies are given below (see also Table 1).

Table 1. Some projects and strategies to improve the effectiveness of teaching and learning in the biological sciences at Victoria University of Technology (VUT). Funding (\$Aus) is indicated where applicable. EM = Environmental Management; FT = Food Technology; CL = Communications and Language; DEET Equity = Department of Education Employment and Training Equity Funds; TLF = Teaching Learning Fund; TQIP = Total Quality Improvement Project.

Project/Strategy	Year	Staff (Dept)	Funding (Source)
Gender Inclusive Laboratory Curriculum	1992	2 (EM)	7 000 (VUT-DEET Equity)
Skills Enhancement Program	1991	4 (FT,EM,CL)	5 000 (VUT-TLF)
Academic Language Skills	1991-93	2 (EM,CL)	5 000 (VUT-TLF)
Quality Improvement in Laboratory Teaching and Learning	1994	4 (FT,EM,CL)	25,000 (VUT-TQIP)
Student Diversity Program	1994	1 (FT)	5 000 (VUT-DEET Equity)
Integrated Study of Communications and Biology	Ongoing	2 (FT,CL)	None
Appropriate Assessment	Ongoing	3 (FT,EM)	None
Study Camps	1994	1 (FT)	None

- (i) **Gender Inclusive Laboratory Curriculum.** This project investigated the effects of gender on student performance and satisfaction in first year biology and bioscience laboratory classes. The study found equivalence between male and female students in all aspects of lab work except report writing, where females experienced significantly greater difficulties due largely to perceived ambiguities about the nature and purpose of the reporting task and consequent lack of confidence in their own writing skills. The major outcome of this project was the comprehensive rewriting of lab manuals in several biology-centred units in order to clarify and better explain the report writing task.
- (ii) **Skills Enhancement Program.** This project (see Goodall *et al*, 1993) developed learning skills and confidence in students just failing (scores in the range 45 to 49 percent) in the first year units Biology 1 and 2. The program was conducted as a 'winter school', with students undertaking a week-long tutorial covering the syllabus of the previous semester. The program also covered essential study skills such as effective reading and understanding the meaning and intent of exam questions. Program outcomes were gauged by comparing the supplementary exam performances of participants and non-participants, and by interviewing participants. By both measures, the program was an outstanding success.
- (iii) **Academic Language Skills.** One outcome of the Skills Enhancement Program described above was a recognition of the special needs of students from non-English speaking backgrounds (NESB). A project was therefore implemented to help such students develop skills and confidence in the use of academic English in the context of the first year units *Biology 1* and 2. This project (see Goodall *et al*, 1993) was run as a series of tutorials examining the use of academic English and alternative or complementary ways of presenting information in biology (such as flowcharts, diagrams, etc.). The short-term outcomes of this project were mixed: most participants made impressive gains in their classroom skills and confidence, and indeed were generally very happy with their progress; however, their linguistic skills generally collapsed under exam conditions.

An important element in this project was the development of a diagnostic exercise conducted early in the academic year to identify first year students experiencing difficulties with academic language and expression. Students so identified are counselled and encouraged (regardless of NESB or other status) to use concurrent support services offered by the Education Unit in the Department of Communications and Languages.

The project was later extended to include the development of a series of study modules intended to help *all* students gain mastery of the huge vocabulary of biology and of the use of academic language in general.

- (iv) **Quality Improvement in Laboratory Based Teaching and Learning.** This project seeks to restructure laboratory schedules in the units *Microbiology I* and *Biochemistry* in order to provide greater opportunities for development of skills in critical thinking, cooperative learning, and report writing. A major thrust of our efforts is to engage postgraduate tutors in the process of educational change by encouraging them to develop a philosophy of and commitment to effective laboratory teaching. Workshops and written guidelines on effective lab teaching have been designed and will be provided for tutors at the commencement of teaching in Semester 1, 1994.
- (v) **Student Diversity Program.** This project, running concurrently with the lab-based quality improvement program described above, investigates the impact of diversity on student experiences and outcomes in the unit *Microbiology I* offered in EM and FT. This is a core unit for environmental management, food technology and applied biology majors, and a very popular elective for psychology majors (about two-thirds of all second year psychology majors select this unit, accounting for about 50 percent of enrollees). The consequent diversity of student interests and purposes has posed a challenge in the development of an appropriate curriculum for this unit. This project is generating comprehensive information on student experiences and expectations, guiding us in appropriate redesign of the curriculum in order to further develop an 'inclusive' approach to teaching and learning in microbiology.
- (vi) **Integrated Study of Biology and Communications.** This project seeks to integrate as much as possible the curricula of the first year units, *Communications for Science* and *Biology I*, with the intent of providing a specific context for studies in communication. Staff from each discipline have contributed to the design of assessment in the other: thus, for example, biology staff assist students in the selection of lab reports already assessed within the *Biology I* unit for resynthesis and presentation within the *Communications for Science* unit. The closer integration of these units has made it much easier to guide students in the development of communication skills.
- (vii) **Appropriate Assessment.** This is an approach or strategy rather than a specific project, and is used across a wide variety of units in the biological sciences. The approach - development and evaluation of assessment methods appropriate to the aims of the unit and the interests of the students enrolled in it - has been applied successfully in ongoing semester assessment and in supplementary assessment.

Examples of appropriate semester assessment include getting students enrolled in *Cell Biology* to build three-dimensional models of animal cells, complete with guide booklet; or getting teams of students enrolled in *Environmental Biology* to prepare and defend high quality posters on conservation issues in Australia. Each of these assessments are offered

in addition to the more traditional essay so that students uncomfortable with alternative assessment are not disadvantaged.

Supplementary assessment in several units (offered to students scoring overall 45 to 49 percent in the unit) now consists of getting students to prepare a series of essays exploring major themes covered during the semester, rewriting a major semester essay, and/or resynthesising a series of lab reports; the exact mix of tasks reflecting the areas of activity where the student most needs to improve to a standard judged sufficient to pass the unit. Such supplementary assessment is not a 'soft option': the tasks are fairly weighty and commonly impose a credit-grade passmark. Yet the pass rate for supplementary assessment is now about 80 percent compared to about 20 percent when supplementary exams alone were offered.

Students are generally enthusiastic about alternative assessment strategies (whether applied in semester or in supplementary mode), commonly reporting a more insightful and satisfying learning experience. This strategy and its outcomes are thus very much in keeping with Ramsden's (1992) ideal of assessment to promote understanding.

- (viii) **Study Camp.** This activity involves the conduct of voluntary twice-yearly study camps where students enrolled in *Human Bioscience* intensively workshop learning materials prior to the end-of-semester exam. This innovation has taken on a life of its own: students plan and administer the camp (in the bush near Melbourne), with lecturers attending as enthusiastically-received guests who focus and lead the learning activities. Apart from the obvious learning benefits, students also gain a strong sense of camaraderie and 'ownership' of the program.

All of the projects described here have required major inputs of time and effort from staff and from participating students; but each has been shown - quantitatively or qualitatively, formally or anecdotally - to repay those efforts in improved teaching and learning.

FUTURE DIRECTIONS

The Faculty of Science is currently sponsoring a major review of the first year units *Biology 1* and *2* with a view to providing (for introduction in 1995) a much more comprehensive introduction to the concepts and tools of modern biology with an expanded laboratory curriculum fostering critical thinking, cooperative learning and improved communications skills. The conceptual inputs to this review process are wide-ranging and draw heavily on insights gained in other projects - thus, for example, our experiences in involving postgraduate tutors in educational change in microbiology will help shape the design and conduct of first year biology labs.

In 1994 FT is introducing a new major in the microbiological and biotechnological sciences. Many new units - such as *Analytical and Preparative Biochemistry* and *Clinical Microbiology and Immunology* - are being developed from scratch and thus present the opportunity to 'build-in' some of the more effective teaching and learning strategies reported here.

Computer aided learning (CAL) has not yet been explored in the biological sciences in EM and FT, although it is being actively developed in the chemical sciences in EM and in the teaching of muscle physiology in the Department of Chemistry and Biology. This technology must make inroads into biology teaching in EM and FT and should be welcomed as an exciting adjunct to support - but not replace - essential personal interaction between teachers and learners.

The increased diversity of majors in EM and FT and consequent increase in undergraduate numbers has lead to rapidly expanding staff and postgraduate profiles in these departments. This in itself serves to diversify teaching and learning as new expertise and new teaching methods are made available. In addition, the increased number of staff and postgraduates contributes to a healthy intellectual culture which is absorbed by students and impacts positively upon their attitudes to learning.

We and our students are living, working and growing in a decade of exciting new vistas: the biological sciences are breathless with discovery and new insights; the tertiary system is reaching out to embrace entirely new constituencies; and teaching and learning are finally being seen as activities to be valued and nurtured. What better time to develop better ways to teach biology?

ACKNOWLEDGEMENTS

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ASIAN BUSINESS CULTURE AND PRACTICE: A MULTI DISCIPLINARY TEACHING STRATEGY

ABSTRACT

The imperatives of focusing on Asia have been made clear by key figures in politics, the arts, science and business. This is not surprising given our location, natural skills base and technology, and the sustained economic growth in Asia. Whilst Asia as a region is not a new frontier for many organisations, new markets and opportunities are opening up less familiar countries like Vietnam and Cambodia.

In the context of Australia's strengthening ties with its Asian neighbours and its growing commitment to the region as a whole, there is an unprecedented opportunity for people across many disciplines in higher education to become actively involved in developing socio-cultural teaching and learning programs that reflect these changes.

This presentation charts the processes whereby a multi-disciplinary team at the Victoria University of Technology developed an Asian socio-cultural and language studies program for postgraduate students from the accounting, law, management and computing disciplines.

Discussion centres on the rationale and objectives behind the development of the program, course content, teaching and learning strategies, networks formed, problems encountered and the solutions explored. Networking with foreign nationals resident in Australia, government agencies, and the business community is critical for the credibility and quality of this educational initiative. The lessons from this case study may prove useful for others wishing to emphasise Asia, and to those for whom the critical mass and group dynamics of a multi-disciplinary program are important considerations. The benefits of cross-disciplinary teamwork and networking are emphasised, and the potential of new technologies implemented for language and cultural studies is illustrated.

INTRODUCTION

The imperatives of focusing on Asia have been made clear by key figures in politics and the business sector. In 1993 the Prime Minister Mr. Keating indicated that the key to future prosperity for Australia was in regional trade and unveiled far reaching plans for the gradual integration of Australia and other Asia-Pacific economies into what he called "the world's most dynamic zone of production". Mr Keating said "I am utterly convinced that our prosperity, our national well-being, our ability to maintain and build a good society, depend on our courage in moving boldly to integrate our economy with the economies of south-east Asia". (Barker p8 1993).

Given our location, natural resources, skill base and technology, it makes sense that Australia better positions itself to tap into a region that continues to display sustained economic growth whilst the rest of the world is facing substantial challenges. The importance of Asia and exporting are embodied in the oft voiced notion of "export or perish" (Bailey, S. 1993 p1).

Asia is not a new frontier for many organisations (Asian markets account for 60% of goods exports) with eight of Australia's top twelve markets being in Asia, and 30% of our service exports via education, telecommunications, information technology, banking, engineering services etc. (Gastin 1993 36). In contrast, less than a generation ago, exporting was viewed as an activity reserved for only the biggest Australian companies and the major markets were in Europe and America. Given that the Anglo-American culture has been dominant in Australian business and is compatible with traditional American and European markets, it is not surprising that many talented businesses have succeeded in trading ventures in Western countries.

Today, niche and broader foreign markets are being explored and developed by companies of all sizes, and the expanding Asian markets are seen by many as the logical choice for opportunities in selling services and value-added goods. An indication of this phenomena is that eighty percent of enquiries to Austrade by Australian Business relates to Asia. However the failure of many Australian businesses to "...complete adequate planning for export into the Asia Pacific Rim and China is evidenced by the number of Australian Businesses that have tried, but have thus far failed to establish export operations in the region - often endangering their domestic operations in the process" (Bailey, 1.)

Many organisations however have rushed into Asian markets with a minimal understanding of Asian business culture and "Australian companies venturing into Asia still need to face a strong learning curve to succeed in business despite the rhetoric of Australia's expanding role in the region". (Corben, R 17 1993). A classic example is a major Australian whitegoods manufacturer that attempted to sell its appliances in China, without realising (or ignoring) buyer resistance to white coloured goods (white signifying death).

What experience is available in the Australian business community of Asian business culture and practice is often bound in generalities, or relates to more traditional markets such as Japan and Malaysia. The expansion into new Asian markets requires different perspectives on local business culture and practice as Asia is truly a portrait of diversity, and protocols, procedures and tactics suitable for Japanese business for example, may be inappropriate in Vietnam, Cambodia, Thailand or China.

Even closer to home for many of us involved in education, some pointed remarks have been made about the forays by some of our institutions into selling education to Asia. The Director-General of the Asia-Australia Institute, Professor Stephen FitzGerald claims that Australian universities have a reputation in Asia as "the carpetbaggers, the gold-diggers and the mercenaries of education" led by people with "no knowledge of or intellectual interest" in Asian societies (St James Ethics Centre Lecture, November 1993).

In the context of these strengthening ties with its Asian neighbours and the challenges such relationships bring, there is an unprecedented opportunity for people across many disciplines in higher education to become actively involved in developing socio-cultural teaching and learning programs. Such programs may provide graduates from many disciplines (the arts, food technology, management, accounting, computing, education etc) with the knowledge and skills to facilitate their participation in enterprise in the global economy. This enterprise consists of exports, imports and substantial investment in this country by Asian organisations that see Australia of strategic

importance (for example through Citic Australia, the Chinese government's investment vehicle in Australia.) (Butterworth, L. 1993 4

UNIT DEVELOPMENT AND THE MASTERS PROGRAM

The recognition that business graduates need to develop effective intercultural communication skills to succeed in both domestic and international markets led to the development of the Asian Business Culture and Practice unit for the Master of Business (International Accounting) program conducted by the Accountancy and Law Department of the Victoria University of Technology. A key feature of the Masters course is to integrate technical skills, cultural literacy and an understanding of international enterprise and global business strategies.

The unit operates within the Masters program to assist students to understand that a country's technical, behavioural and legislative frameworks develop within a cultural context, and that an understanding of this context is essential for effective business interactions.

In addition to International Accounting post-graduate students, initial planning showed an interest in such socio/cultural studies from postgraduate students in Manufacturing Management, Human Resource Management, Economics and Computing.

A multi-disciplinary team was assembled to develop the curriculum. This team comprised staff from the Department of Accountancy and Law who were interested in culture and had experience in Asia, staff from the Department of Asian and Language Studies with broader expertise in Asian language and culture, and a Department of Management staff member with an interest in cross cultural communication and management frameworks. The subject was jointly coordinated by staff from the Department of Accountancy and Law and the Department of Management within the Faculty of Business, and the demand for the course quickly filled all available places.

The focus of the unit was on Asia but it was obviously impossible to deal with all the cultures that are encompassed in Asia in any meaningful way. However, it was considered necessary to study a number of countries to allow students to appreciate differences and similarities within Asia, and to develop general principles that might be applied in preparing to do business with any cultural group. In selecting countries for study it was necessary to consider the University's resources and strengths as well as choosing countries which were of strategic importance to Australia. It was decided to study Japan - Australia's major trading partner; China - Australia's likely future major trading partner; and Vietnam - an emerging market where Australia has been in the forefront of development.

Aims

Aims of the course were to develop an understanding of:

the styles of business communication practised in Japan, China, Vietnam and Australia

the cultural, political, social and economic contexts of Japan, China and Vietnam

the appropriate behaviour in social and business interactions with the target countries

appropriate interpersonal skills in speech and etiquette

Objectives

On completion of the subject, it is expected that students will be able to:

appreciate the importance of cultural norms and styles of behaviour

choose the most appropriate communication style for inter-cultural business interactions

go beyond cultural stereotypes in business and social interactions with people from Asian backgrounds

understand how to assist Australian business to interact more effectively in the region

demonstrate an understanding of the similarities and differences of business communication, practices and conventions in Australia, Japan, China and Vietnam

Teaching and Learning Strategies

In order to heighten the impact of the country studies a saturation approach was used in an attempt to immerse participants in an experience to a degree not attainable in a more fragmented 13 week evening class format. Participants were given an intensive course of five full Saturdays comprising of:

- Day 1 used to introduce the unit, emphasise the importance of Asia to Australian business, consider generally some of the issues in doing business in Asia and to increase awareness of culture and communication cross culturally.
- Days 2-4 seminars on Japan, China and Vietnam (appendix 1)
- Day 5 an evening session provided the opportunity for students to reflect on differences and similarities between the countries studied. They were also asked to apply general principles in dealing with particular business problems and in communicating across cultures.

The seminars were held at the University's City Campus to enable a lunch in a restaurant of the country being studied to be incorporated into the day's activities. The plush Boardroom venue, which is normally reserved for special functions, created a sense of occasion which was underlined by the charts, maps and cultural artefacts provided by each teaching team.

On day 1 a cross cultural role play (BafaBafa) was used to emphasise key issues. Participants are divided into two cultures. Each has its own set of rituals. One culture invites guests from the other culture to visit. The guests are trying to do business, work out what is going on, and determine how to operate in this unfamiliar context. The role play emphasises some communication problems arising when you take your preconceived ideas and attitudes to another culture and they don't work. In the feedback session that lasted two hours, participants were asked to give their perceptions of what was going on in the other culture, and often their view was a very distorted one. This exercise was judged by all participants as invaluable in setting the scene for the rest of the unit.

The teaching team for each country consisted of at least 3 people who were expert in language, social, political and economic aspects, as well as having practical experience in business negotiations. Australian expatriates who had worked or were doing business in the country provided additional case study-style insights. Dorothy Button outlined her tourism ventures in Vietnam, and David Corbett detailed experiences of dealing with governments in Asia. The discussion of the issue of corruption became more complex when examples from Australia in recent times were aligned with perceptions about corruption being endemic in Asia. The joint

subject coordinators from the Accounting and Management Departments delivered days 1 and 5, and provided continuity by attending each of the sessions and contributing in their areas of interest and expertise.

As country nationals conducted the major part of the three country seminars, their anecdotes, experiences and teaching styles demonstrated the unique aspects each country in an immediate and observable way. What was particularly noticeable was that the Asian teaching styles seemed to be more structured and less interactive than participants had received in other subjects, but this could be a function of the presenters having to cram a lot of content into a day's program, as much as a matter of cultural communication styles. The student assessment tasks consisted of reports on Vietnam, China and Japan, and a major management report in which students compared characteristics of the three countries and prepared a detailed analysis of issues a company would need to consider prior to entering the chosen market (appendix 2).

STUDENT PROFILE

Twenty seven students elected to take the unit. Fourteen of the students were completing post graduate management programs and thirteen were from the post graduate accounting program. There was significant interest from Economics and Computing students, but a change in their course structures removed the option of doing such a unit as an elective.

The University is in Melbourne's western region and the ethnic backgrounds of the students reflected the multi-ethnic mix of the region. The student group also exhibited wide differences in maturity, age, world experiences and contact through business with Asia. Participants who had visited particular countries or had friends and acquaintances amongst those nationalities were able to contribute much to lively discussions. Six participants had significant experience in doing business in Asia, and this provided a rich source of background and an interesting counterpoint to views of the presenters.

STUDENT FEEDBACK AND EVALUATION

The students generally responded very positively to the unit with 53% giving the unit the highest possible rating and all participants rated the unit as rewarding.

At the completion of the unit, participants were asked to comment on the major issues in doing business cross culturally. Responses included:

"It is important to become aware of the other nation's culture when doing business cross culturally. Although you should be natural and exhibit your own culture, you should be sympathetic towards the other's culture."

"A major issue in doing business cross culturally is the understanding of values and cultural difference in business relationships. Without an understanding of a country prior to visiting, a lot of harm can be done accidentally to future relations.

Seventy percent of participants commented that such a unit should be an integral part of their course - 32% of students considered the unit should be an essential part of their particular post graduate study program and a further 38% considered the unit as at least highly desirable.

The innovative organisational and administrative arrangements were generally well supported with 67% preferring the all day Saturday seminars over the traditional one night per week for a semester.

Most students, 68%, considered the lunches (which were paid for individually by students and staff) as a useful part of the day's activities. One can only wonder what the percentage would be if the University footed the bill!

The off campus location was favoured by 86% of students and 93% of students were more than satisfied with the administrative arrangements (which were complex given the number of presenters involved).

ISSUES FOR THE FUTURE

The main area of discontent expressed by students was in relation to the availability of resources for assignments, with 61% of students considering resource availability unsatisfactory. This, in part, reflects a general lack of up to date, in depth and authoritative materials readily available on aspects of business communication in certain Asian countries (particularly Vietnam). This response may also be a reflection of the stage of development of the Victoria University of Technology's Library, but that facility boasts extensive technology databases as a counter to its reasonably bare shelves compared to traditional institutions. There are questions about the confidence or willingness of some students to use their initiative to seek out information from likely trade, industry, professional and diplomatic sources, which were mentioned by presenters.

A second area of concern, mentioned by a number of students, was the degree of superficiality that is inevitable from trying to deal with a country in only one seminar. It is impossible to deal adequately with all issues and perhaps a lesson learnt from the unit was the need for the presenters who, as experts, felt the need to impart so much as "essential information", to further prune their content. A future strategy to deal with the overload of material on the day is to prepare a manual of pre-class readings so much background or supplementary information may be separated from the main core. However in the final analysis the best that we can realistically hope to achieve is to promote a level of awareness as expressed by one student;

"I now have a basic understanding of the business and cultural aspects of these countries. Although the course, because of time, is unable to give me a full indication of what is required, it has given me an insight of some areas which I can look into more deeply at a later date."

The notion of rotating at least one of the countries each time the course is run (for example replace Vietnam with Indonesia) is being considered to maintain the freshness and interest of the team, and to build up a wider resource base of presenters. If the large enrolment continues in the future, it may be possible to offer and run four or five specific country studies, three of which would need to be chosen and completed by each participant.

Whilst the course deliberately focused at a fairly general level on principles of cross cultural communication that were relevant to doing business in Asia, some participants would have preferred to see coverage of fewer examples and illustrations and focus more carefully on a major case study. Whilst this has merit in establishing depth and intensity, it may be that a compromise will have to be reached on this matter. The danger of a further look primarily at the experiences of one or two firms doing business in a particular country is the possible perception that there is a "correct" way to do business with that country. This is certainly not the case and by developing

principles for cross cultural communication, it is hoped that students can learn basic attitudes and sensitivities that can be adapted to a variety of business situations and countries.

Students were generally positive about the assessment requirements, but learning outcomes may be improved if assessment is adjusted to include field placements or interviews with firms dealing in Asia. This may be more appropriate in relation to specific countries such as Vietnam, given the lack of literature available. It proved possible to set the same basic assessment question for two discipline streams, and achieve the desired outcome from both the accounting and management perspective by instructing each group where their emphasis should lie - both groups on basic cultural awareness, accountants on performance measurement and managers on decisionmaking.

It was fairly noted that perhaps the downside costs to the phenomenal economic growth in Asia should have balanced the economic miracle view. Future presentations of the course will more carefully address ethical issues connected with business activity in terms of pollution, urban overcrowding, environmental degradation, displacement of traditional residents and traffic chaos.

Some participants felt that there should have been more emphasis on the practicalities in utilising foreign nationals resident in Australia in planning and developing overseas ventures.

All country studies incorporated a small component of language studies, which in the time available could give students no more than a brief introduction to the characteristics and complexities of each language. Future participants will be able to avail themselves of new technology to complete a more comprehensive self-study language component using the interactive book and touch screen systems now available.

The interactive book comprises an IBM compatible computer without a screen, and equipped with a barcode wand and sophisticated soundcard, microphone and speakers. Japanese materials have been converted into an interactive program where the computer records the participant's voice, then makes a comparison with appropriate pronunciation. The barcode activates certain words, procedures, exercises in the hard-copy, and a random testing program is built in.

The touch-screen programs offer one-to-one training in Chinese and Japanese that enables students to accelerate learning at their own pace. The touch-screen displays characters, gives correct pronunciation of words/phrases, and gives feedback on the context of their use.

A third more cost-effective system is in preparation for the next year - CDI (CD Interactive) where a special CD player can be hooked up to a television and used in an interactive manner for language training. (Neil Shaw at CALC {Computer Aided Learning Centre} can be contacted on 03-268 1090 regarding all of these systems).

CONCLUSION

This paper reports on development and teaching in an innovative unit in cross cultural communication. The unit was developed to introduce students to issues pertinent to business operating in Asia, and to give students a perspective that may be useful in further studies or their professional capacity.

The unit can be judged to be successful in terms of substantially meeting its objectives. The information conveyed by students in their written reports, combined with the level of animated discussion at the final seminar and supported by individual subjective appraisals, all indicate increased awareness in dealing with business people from various Asian cultural backgrounds.

The myth of Asian homogeneity was explored and the similarities between people were recognised. The following quote from one student expresses what the course set out to accomplish:

"I found myself having a very biased attitude towards Asian people just because they were different. But now all I want to do is find out about them and their culture. It goes to show that just a little bit of education can change your whole attitude towards Asian people. They are just like us even more friendly and caring."

This project has made many staff aware of the positive outcomes that can be achieved through cross disciplinary co-operation and networking with industry and ethnic communities. There are many areas of business with clear overlaps between disciplines, and hopefully this project may provide an incentive for the development of networks and a team approach to developing and delivering units that reflect our changing environment.

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